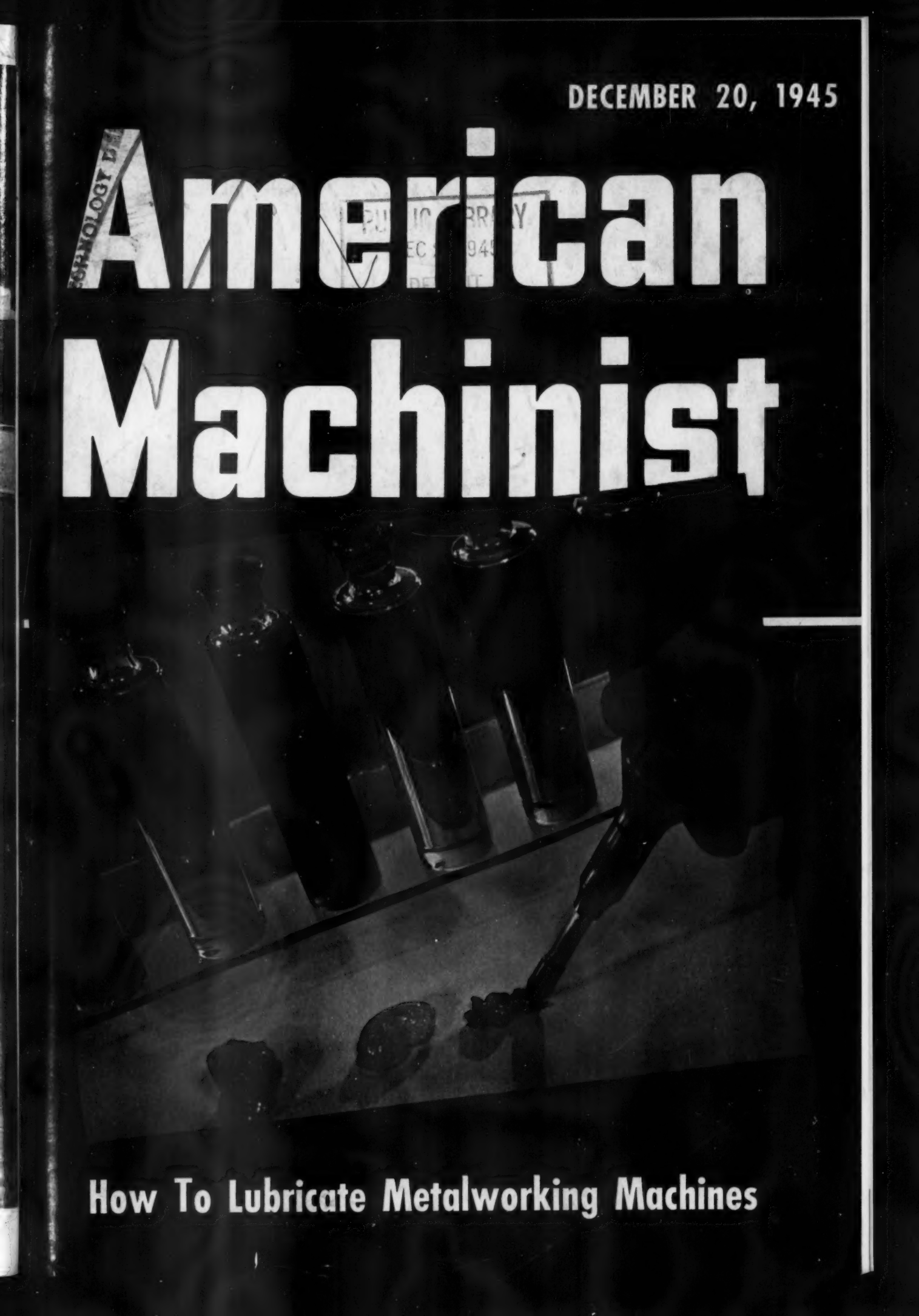
DECEMBER 20, 1945

American Machinist



How To Lubricate Metalworking Machines

Shown is a Heald No. 48A Bore-Matic, rough and finish borizing an electric tool housing

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If you're ready for peacetime production, but bogged down unfortunately by a crying need for highly skilled operators—here's a workable solution to your problem. Transfer some of your precision work to Heald Bore-Matics. Average operators can be trained in minimum time to operate these machines, producing work to the highest standards of accuracy and finish. Such results are possible and practical because Heald Bore-Matics' inbuilt craftsmanship plus single-point principle of finishing with cemented carbide or diamond tools gives "tenth" precision, shift in and shift out . . . because their operating ease and automatic features make "expert" operators unnecessary. As a means of putting precision at less cost in production 24 hours a day Heald Bore-Matics are worth looking into. Why not get in touch with us, *today*.

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December 20, 1945

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RETURN POSTAGE GUARANTEED

VOLUME 89 — NUMBER 26

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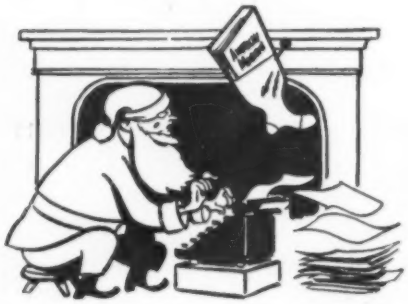
American Machinist Chips

That Man's Here Again . . . The editors of *American Machinist* probably will be after *Chips'* scalp for suggesting that collectively they be termed "a little fat man with red knickers, white beard and a fat little belly that shakes like a bowl full of jelly, etc."



Nevertheless, in conveying to you their very best wishes for a Happy Holiday Season, ye editors have brought you a load of Christmas presents, including the following:

Eight more editorial pages than during the paper shortage years, beginning a new policy of increasingly more for your money.

A 4-color cover, first of a series. This one shows bottles of typical lubricants for metalworking machines and some of the greases commonly used.

This cover keynotes a special section of a new type (as previously promised), "How to Lubricate Metalworking Machines." It is printed in blue and yellow with plenty of diagrams; plenty of factual information too, with all the big oil companies cooperating. It was written by Associate Editor Harold Flynn, who came to us from Canada where he covered metalworking and plastics while editor of papers in those fields. Is a member of ASTE, SAE and SPI.

Notice, too, that the lead article in this issue is heavily illustrated in drawing-and-caption style with shaded, perspective-type sketches that are easy to understand.

Among other features begins the series of "easy to take" articles on electronics, written by Executive Editor John Haydock from the highly successful GE film training course.

(And, just not to be outdone, ye *Chips* editor decided to join in the colorful Christmas spirit with the masthead changed from the usual black.)

So from all of us, Merry Christmas!

Good Things Ahead . . . Just a word about 1946. In the next issue, January 3, watch for the summary of "Wage Incentives" . . . an 8-page special Report to Metalworking written by Editor Burnham Finney and News Editor Ben Corrado. From what we have seen, it's going to be good.

In the number following that, January 17, your old friend the "Annual Review Number" makes its 33rd appearance —bigger and better than ever. This reference volume, as veteran *American Machinist* readers know, is a yearlong reference for buyers of metalworking equipment and supplies, and catalogs all the new equipment items that have appeared in *American Machinist* during the previous year. More about this in the next issue.

Hargest Harvest . . . In the mail comes a nice little note from overseas editor Bill Hargest, *American Machinist's* digger-up deluxe of wartime and postwar news on important happenings in European Metalworking.

Much of what Bill writes you have seen and will be seeing in the form of regular articles. Earmarked for this more gossipy column are the following sidelights of some of Bill's "Adventures in Thunderland":

"On the way from Paris to Frankfurt I rode a locomotive by way of variety. This was the first time in 15 years that I had been on one and it was quite a thrill. (Ed. Note: Bill is a railroad man from way back.) *In the States I had been used to keeping at least 2 gauges of water in the boiler. The French fireman on this trip made my hair stand on end and chills run down my back by persisting in keeping the water at the lowest possible level in the glass—more often than not an empty water column stared me in the face. Since he was 45 years old and had been firing a locomotive practically all of that time, I figured it was safe enough to sit on the deck. In my opinion, the fact that I am in London writing this letter is evidence that the guy had more luck than good judgment.*

"We picked up a new locomotive at the frontier—this time an American-built 2-8-2 freight engine—which was somewhat the worse for wear. Five miles out we had to stop and try to pry loose a brake shoe from the main driving wheel that was red hot. A German engine crew, guarded by two Frenchmen with business-like Springfields, did the job. To my surprise the guns were not loaded. However, I presume they had confidence in the bayonets, which were always in evidence."

Picture Gallery . . . No stranger to *American Machinist* readers is Dr. C. V. Slottman, Manager Applied Engineering, Air Reduction Sales Company. A long-time contributor to *American Machinist*, his new series on flame cutting is currently appearing and receiving wide acclaim.

We coaxed a picture from him, shown here, and the following personal notes:

"I am a graduate of Massachusetts Institute of Technology, Chemical Engineering; and of the University of Berlin, Physical Chemistry. I was Professor of Chemical Engineering at M.I.T., and Chief Combustion Engineer of United Steel Companies, England. I have been associated with Air Reduction since 1934.

"My mentionable *avocations are fishing—both salt and fresh!"*

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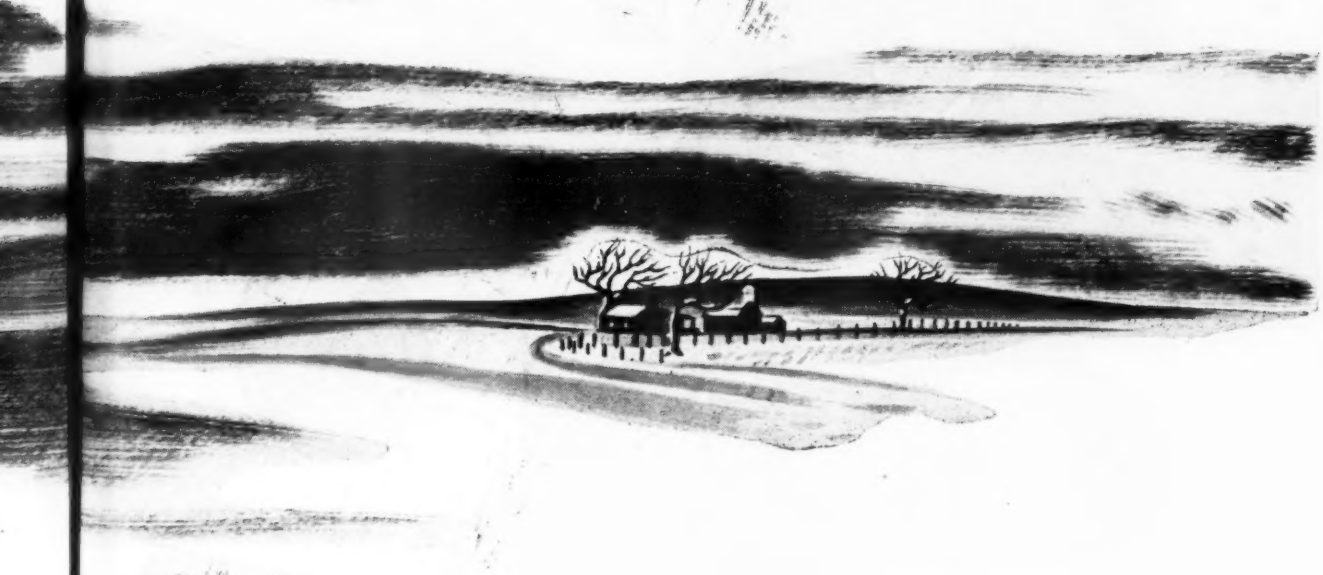
Good Will Toward Men

• At this holiday season we are profoundly grateful that America is privileged to enjoy a peaceful Christmas — the first since 1940. And for the New Year let us resolve to keep that peace.



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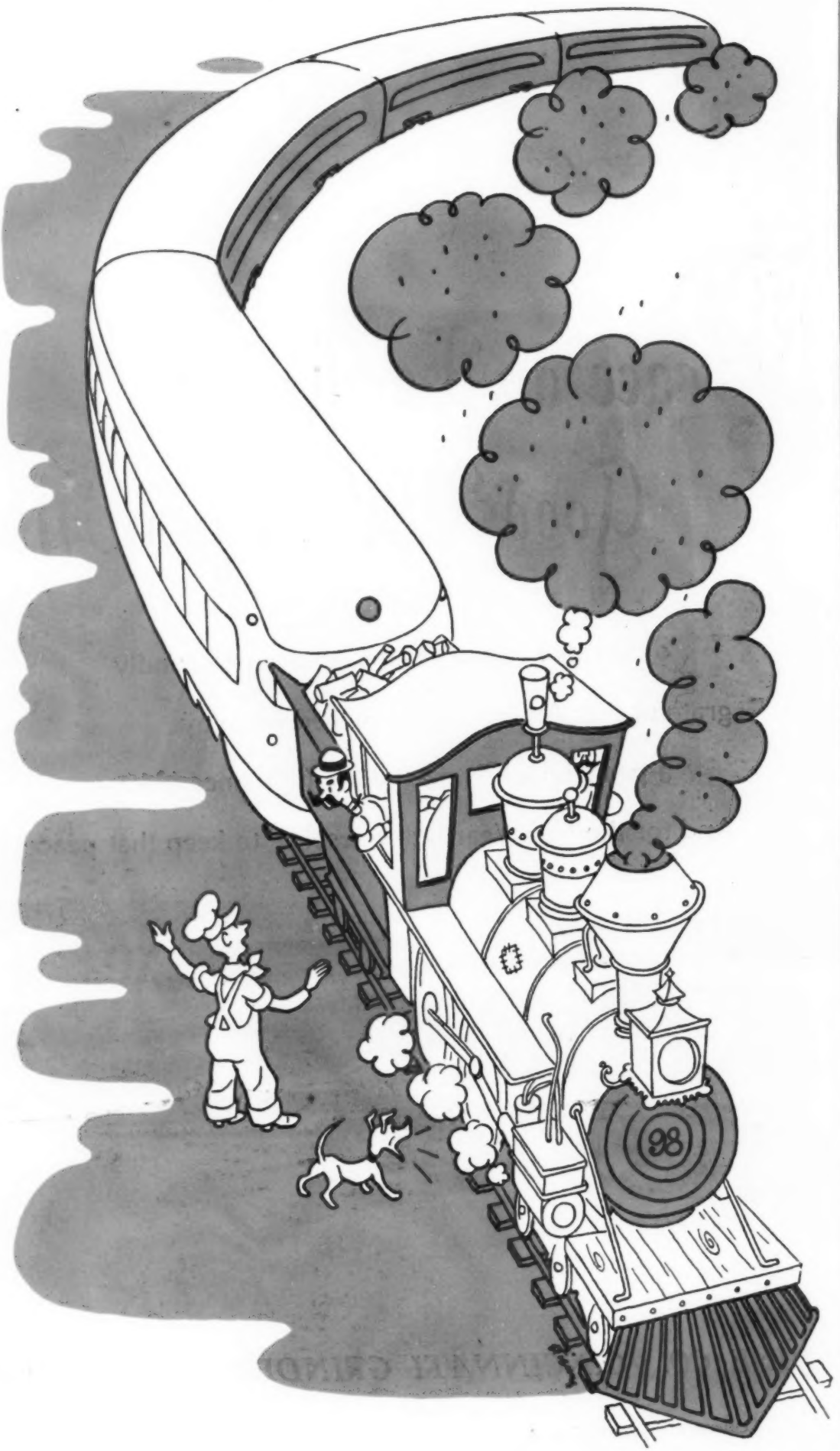


you wouldn't

hitch a modern train to an ancient locomotive

Nor should you put carbide cutting tools on a lathe that cannot transmit the power to use them at their maximum efficiency. Carbide cutting tools have increased horsepower requirements as much as 300 per cent. They have increased cutting speeds 200 to 500 per cent.

Jones & Lamson Turret Lathes and Fay Automatic Lathes are designed specifically for the most efficient use of carbide tools. They have the rigidity, they can transmit the power, they are easy to operate.

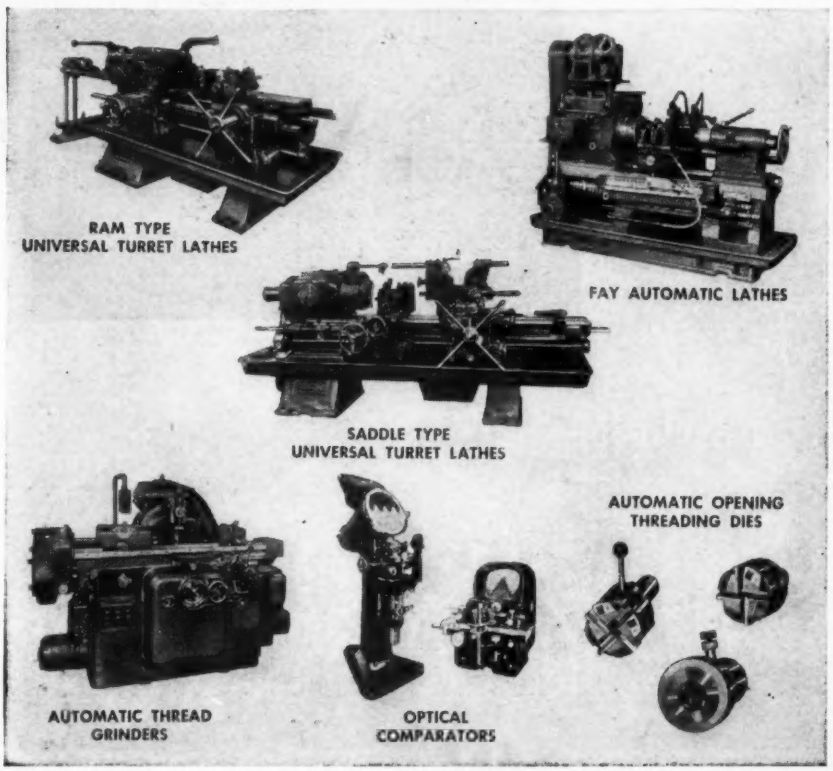
In the battle of costs to come, only those who use the most efficient tools and methods will survive. Now is the time to scrap your obsolete machines and replace them with good War Surplus machines or new machines. 'Phone now for one of our engineers to help you choose the equipment that will help you to win in the battle of costs to come.

Turret Lathes

What HORSEPOWER Are You Using?

Combined cuts like these, require as much as 300 per cent more horsepower with carbide tools than with high speed steel tools, but carbide halves the cutting time.

Engineered to "Carry the Load" for Most Productive Operation With Carbide Cutting Tools



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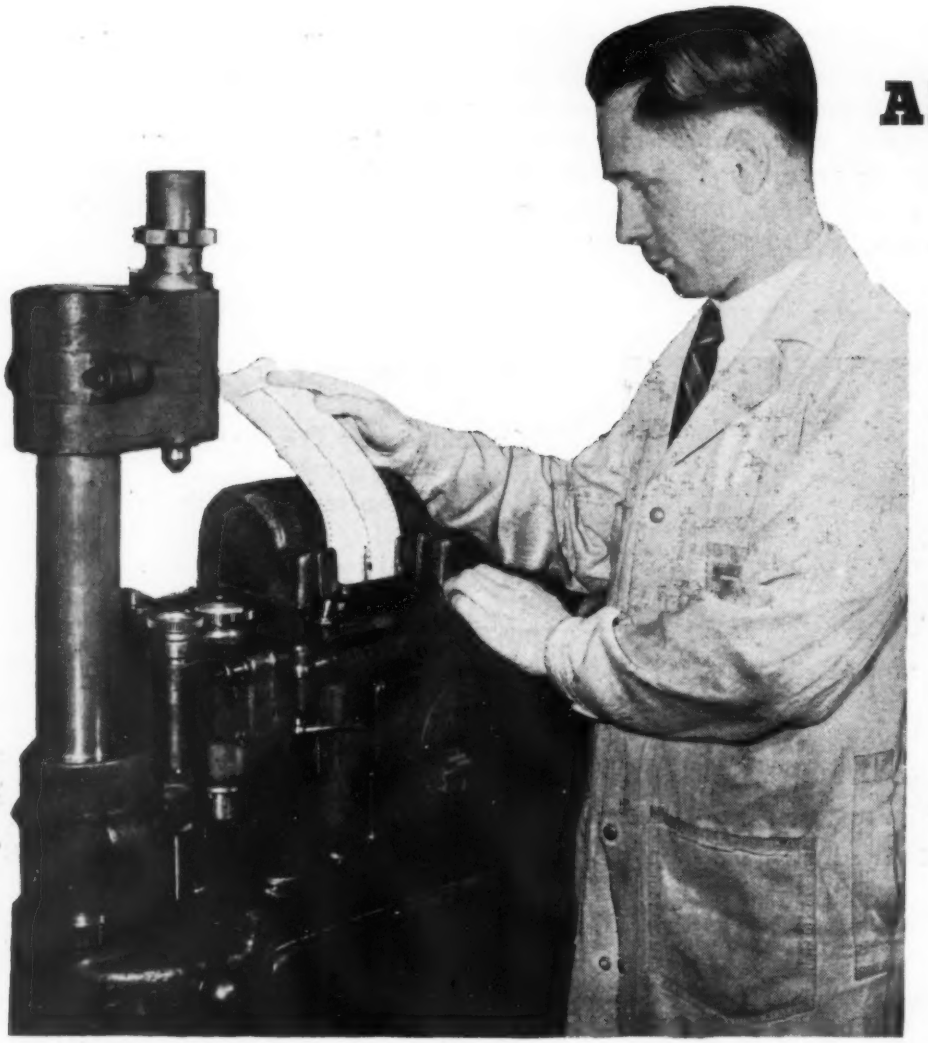
Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

THE "RED LINER" COMBINATION CH

TELLS THE Critical Fr

ABOUT A

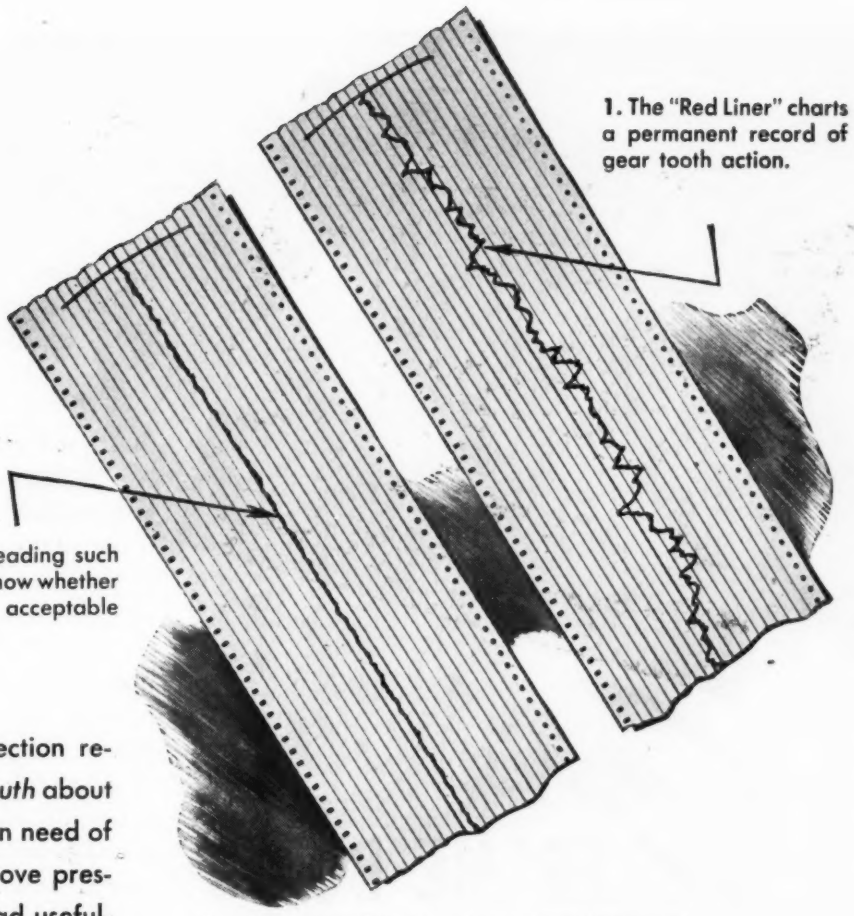


THE FELLOWS METHOD...MACHINES AND TOOLS FOR ALL

ONCHECK

alTruth

UTA GEAR



1. The "Red Liner" charts a permanent record of gear tooth action.

2. With a reading such as this you know whether the gear is acceptable or not.

For manufacturers whose inspection requirements call for the *critical truth* about a gear, and for those who are in need of a recording instrument to improve present checking methods—the broad usefulness of the Fellows "Red Liner" makes it well nigh indispensable.

Built to provide a precision *combination check* for concentricity . . . tooth spacing . . . and operating tooth action — and equipped with a charting mechanism — the "Red Liner" shows up the minutest errors and charts them permanently to a magnified scale of 200 to 1.

The "Red Liner" can be easily adapted to the checking of both external and internal gears. It is also provided with a Backlash Measuring Device for checking backlash using a special "limit-type" dial indicator.

Call in the Fellows Sales engineer on your gear inspection requirements—or write for recommendations covering any specific gear inspection problem. The Fellows Gear Shaper Company, Springfield, Vt., or 616 Fisher Bldg., Detroit 2, Mich., or 640 West Town Office Bldg., Chicago 12, Ill.

Fellows

FOR ALL OPERATIONS FROM BLANK TO FINISHED GEAR

Complete specifications on CINCINNATI *No. 3 Centerless Grinding Machines may be obtained by writing for Catalog G-438-3. For a brief description of these machines, look in Sweet's Catalog File for Mechanical Industries.*

Grinding FRAME BOLTS

100 PER HOUR ON A CINCINNATI NO. 3 CENTERLESS

● These illustrations show a CINCINNATI No. 3 Centerless set up for grinding frame bolts by the infeed method. The complete length of the bolt under the head is ground to size in one operation. ¶ There are several reasons for using a No. 3 Centerless for jobs of this type. It is potentially a high production machine, yet it has a number of features to facilitate setup. Heavy duty construction permits unusually wide contact between work and wheel; FILMATIC grinding wheel spindle bearings withstand heavy cuts with no special attention; hydraulic profile truing over both wheels facilitates and speeds up the truing and dressing of the wheels; large diameter infeed handwheel with micrometer adjustments gives you diameter reduction as fine as .0001". ¶ The CINCINNATI No. 3 Centerless Grinder has a very definite place in railway shops. It will be to your advantage to investigate.

Write for booklet G-503-1 "Principles of Centerless Grinding," an unusually informative booklet which is written in nontechnical language. This booklet also contains a chapter on small lot production.

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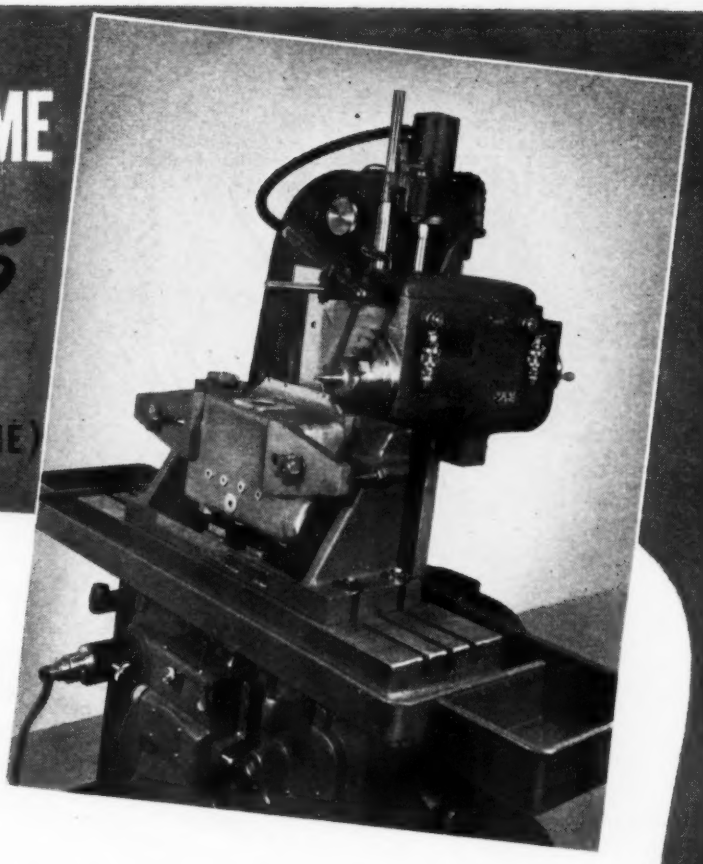
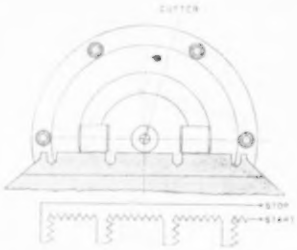
FLOOR TO FLOOR TIME

87 SECONDS

(MILLING FOUR SLOTS ONE AT A TIME)





Sketch of part and operating cycle
Part name: Rear Oil Sump
Material: Magnesium Alloy
Speed: 3600 RPM
Feed: 10" per minute
Production: 36 per hour

CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine. Catalog M-909-2 contains complete specifications. For a brief description, look in Sweet's Catalog File.

Every 87 seconds four slots are milled, one at a time, in oil sump casting . . . that's the production record on the job illustrated above. ¶ The machine is a standard CINCINNATI No. 2-24 Automatic Rise and Fall Miller equipped with a special raised headstock; single speed cam type spindle carrier with 2 hp motor, and special cycle selector. A single station hand-clamping fixture is used. ¶ Rise and fall of the spindle carrier is synchronized with table movement to make the entire operation automatic. After loading the fixture the operator simply flips the starting lever and the automatic cycle takes over, completing the milling operation and returning the table to starting position. ¶ Thus, with some tailoring on a standard machine, another milling problem is solved by Cincinnati Application Engineers. It's very probable that these engineers will be able to work out a more accurate, economical and productive method of handling some of your milling operations. Why not talk it over with them?

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THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U.S.A.

MILLING MACHINES · BROACHING MACHINES · CUTTER SHARPENING MACHINES

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Horizontal Milling Machines

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★ FRONT AND REAR DIRECTIONAL CONTROLS
★ HEAVY FLYWHEEL ON SPINDLE PROVIDES SMOOTH TRANSMISSION OF POWER TO CUTTER
★ FOUR SIZES...EIGHT MODELS

The new Van Norman Horizontal Milling Machines offer many developments and engineering features that make important contributions to faster, easier and more accurate milling. Design and construction features provide maximum rigidity and strength . . . finger-tip controls assure ease of operation . . . adequate safety factors on all units insure long life accuracy. Every engineering feature offers the user greater opportunities to reduce milling costs and increase profits on general purpose and production milling operations.

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√ **New improved columns and bases** are broader, deeper, heavier with generous internal ribbing to assure rigidity.

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√ **Front and Rear Manual Controls** (on larger models) provide ease of lining up the cut and making adjustments.

√ **Hardened alloy steel gears** with greater tooth area are mounted on hardened multi-splined shafts operating on anti-friction bearings assuring long life and quiet operation.

√ **New spindle transmission units** have wider faced gears with greater tooth area.

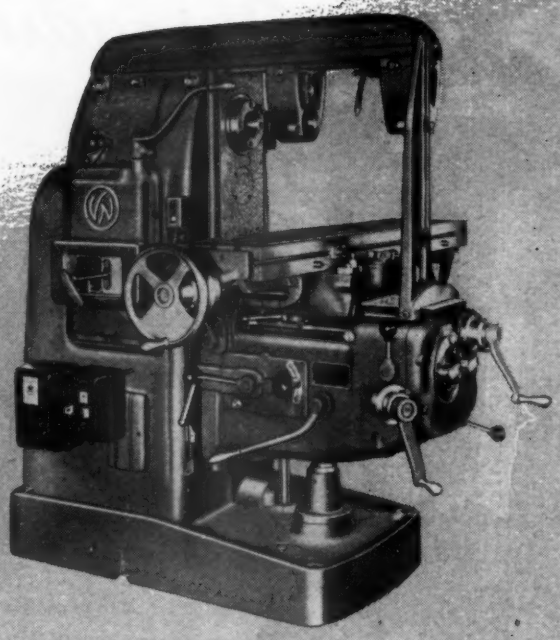
√ **Dials are large and legible,** graduated in thousandths. Hand wheels and cranks release automatically when not in use.

√ **Ram-type overarm** is larger and has dovetail bearing on column ways with locking means at both front and rear of column.

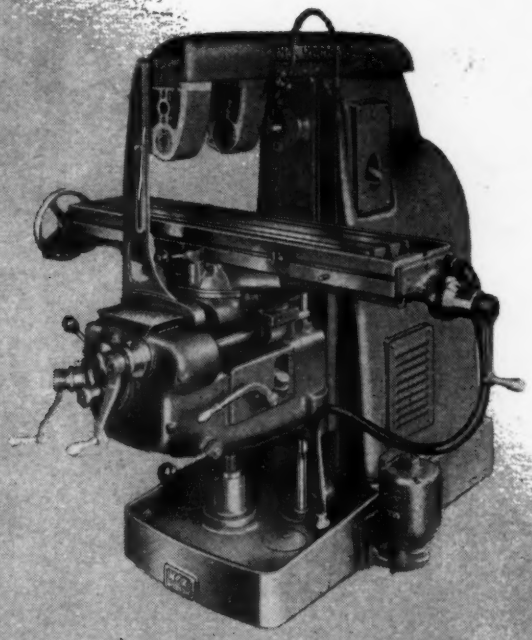
√ **Automatic lubrication** assures thorough oiling of all moving parts of all working mechanisms.

Investigate the new Van Norman Horizontal Milling Machines today. Find out how they cut costs, improve accuracy. Write

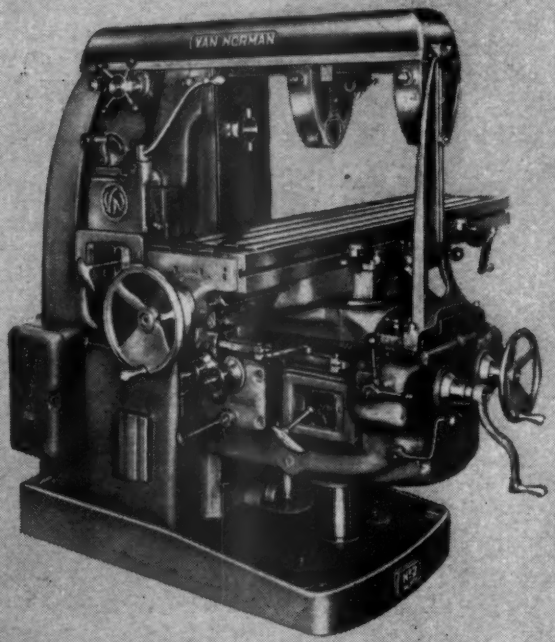
VAN NORMAN COMPANY
SPRINGFIELD 7, MASSACHUSETTS



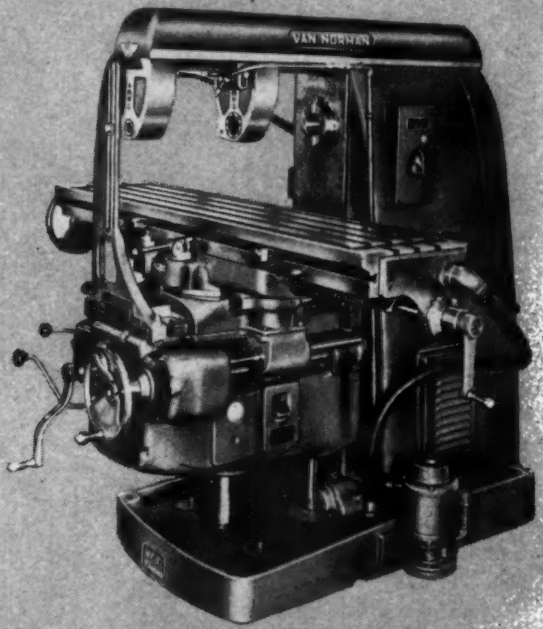
No. 2 Light
Motor 3 HP—Table: 45" x 10"



No. 2 Medium
Motor 5 HP—Table: 50" x 10"



No. 2 Heavy
Motor 7½ HP—Table: 58" x 13"



No. 3 Standard
Motor 7½ HP—Table: 64" x 14"

VAN NORMAN COMPANY

Springfield 7, Massachusetts

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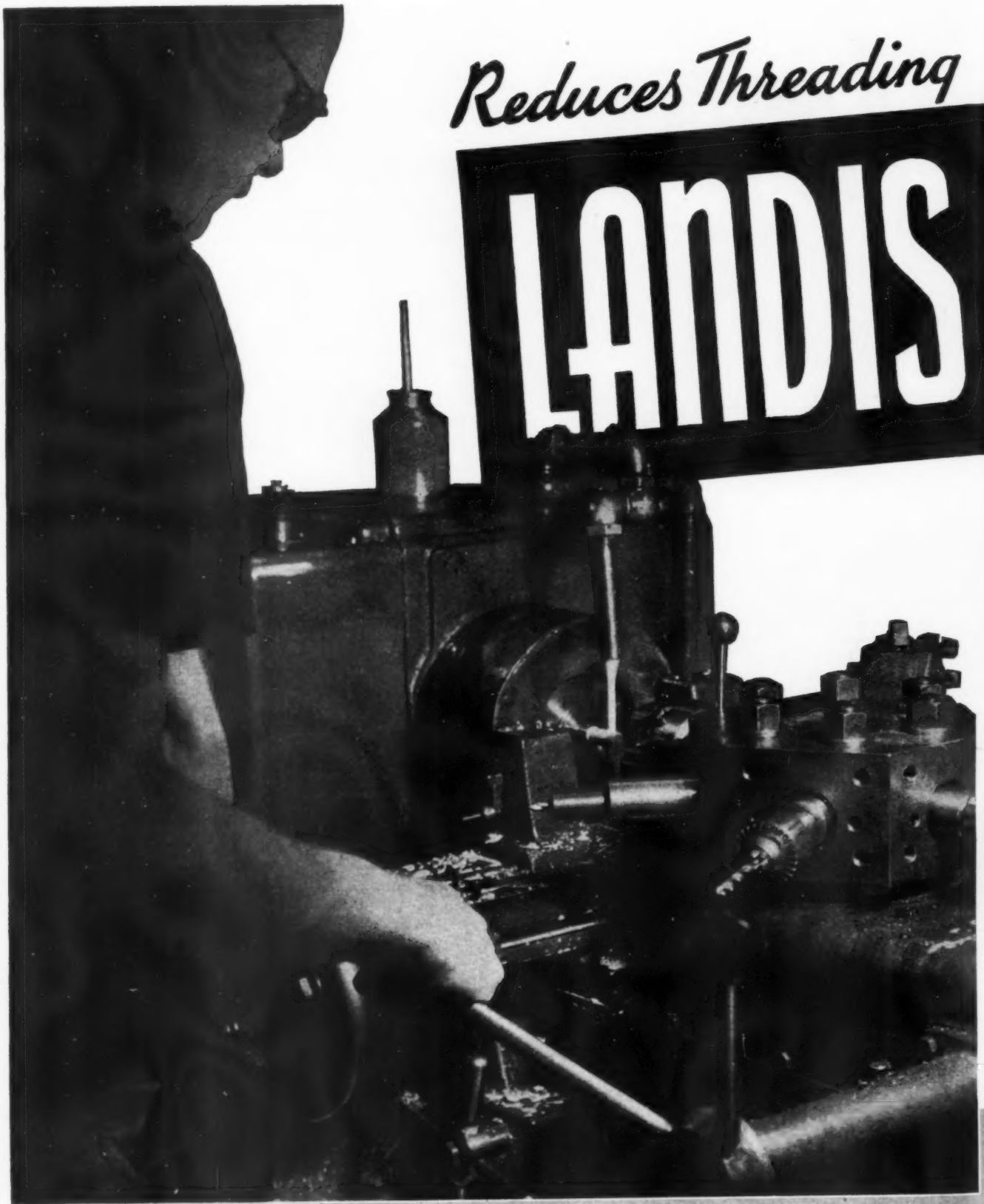

THREADING
AND ROLLING
MACHINES

LANDIS
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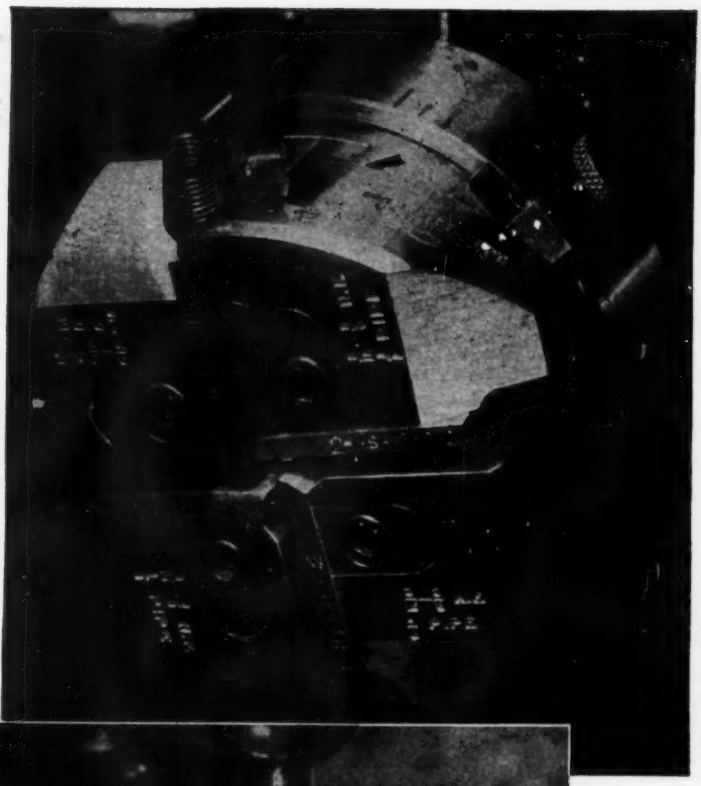
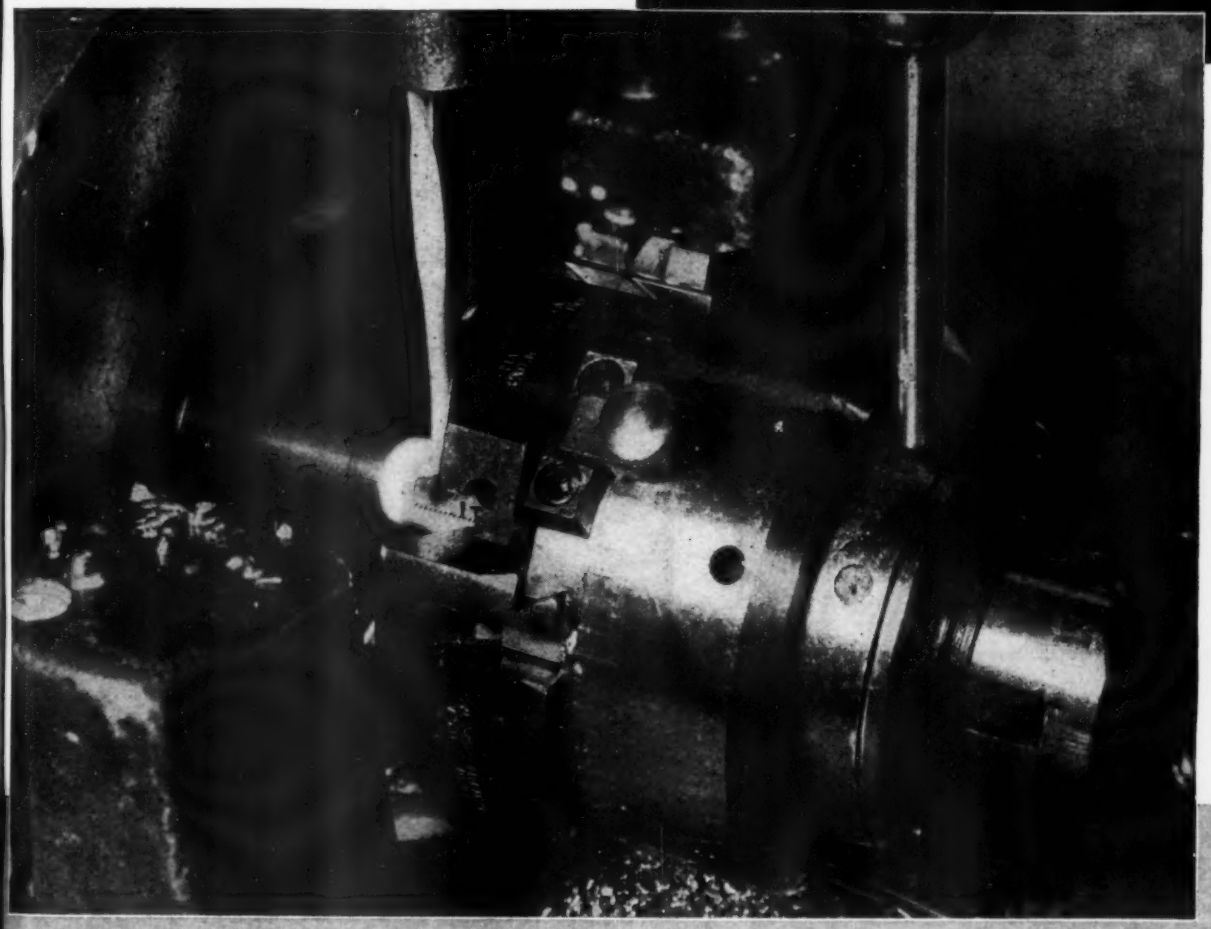
Time and Cost

DIE-HEADS



Submit your threading problems to our engineers for recommendations.



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TUNE IN THE AUTO-LITE RADIO SHOW STARRING DICK HAYMES — SATURDAYS, 8:00 P. M. — E. S. T. ON C B S

Greatest V-Belt Show ON EARTH!

EVERY MEMBER OF ALLIS-CHALMERS GREAT NEW V-BELT TEAM IS SPECIALLY DESIGNED, TESTED AND BUILT TO LICK A SPECIFIC DRIVE PROBLEM, SAVE YOU MONEY AND TROUBLE

THIS ISN'T AN ACT. I CAN EAT UP 180°F TEMPERATURES ALL DAY LONG. IF THE HEAT'S ON YOUR DRIVES, CALL FOR HEAT-RESISTING SUPER-7
THEY CALL ME STATIC-RESISTING SUPER-7 BECAUSE I CARRY STATIC CHARGES TO MACHINES WHERE THEY'RE GROUNDED
DON'T WORRY IF YOUR BELTS MUST PRACTICALLY BATHE IN OIL OR GREASE. JUST ASK FOR SUPER-7 OIL-PROOF. I'M MADE OF IMPERVIOUS NEOPRENE.
OIL
A LITTLE OIL DOESN'T FAZE ME AT ALL. I'M OIL-RESISTING SUPER-7 ... HANDLING 90% OF ALL OILY DRIVE CONDITIONS.

Texrope V-belts are available nation-wide through Allis-Chalmers Dealers and Sales Offices. It pays to make Allis-Chalmers your V-belt drive headquarters.

ALLIS-CHALMERS

Texrope Super-7 V-Belts result from the cooperative research of two great companies—Allis-Chalmers and B. F. Goodrich—and are sold exclusively by A-C.

A 1961

BULLETIN!

SPEED RECONVERSION WITH HELP OF NEW FREE A-C KIT!

Guide to "How to Take Reconversion Inventory" of Drives, Motors, Pumps

Help in the big job of reconverting for peacetime production is now offered to plants everywhere by Allis-Chalmers Mfg. Co., its district offices and distributors. To all who request it, we're sending the new "Reconversion Inventory Kit", planned to speed the task of determining the condition of your existing equipment — V-belt drives, motors, and centrifugal pumps — which will be used in reconverted production.

SUGGESTS PROCEDURE, STATES STANDARDS

Used by foremen, maintenance men, and engineers, the Kit is a real time-saver... leads efficiently to probable trouble spots, helps clear them up. Gives bearing tolerances, resistance formulae, etc., in compact, easily-used form. Check List appraisal charts help determine present and future condition of units inventoried.

HOW TO GET YOUR KIT

For your free Reconversion Inventory Kit, call your nearest Allis-Chalmers distributor or district office, or write Dept. 102, ALLIS-CHALMERS MFG. CO. Milwaukee 1, Wis.

ALLIS-CHALMERS MFG. CO.
Dept. 102, Milwaukee 1, Wis.

Please send Reconversion Inventory Kit free of charge to:

Company.....

Address.....

.....

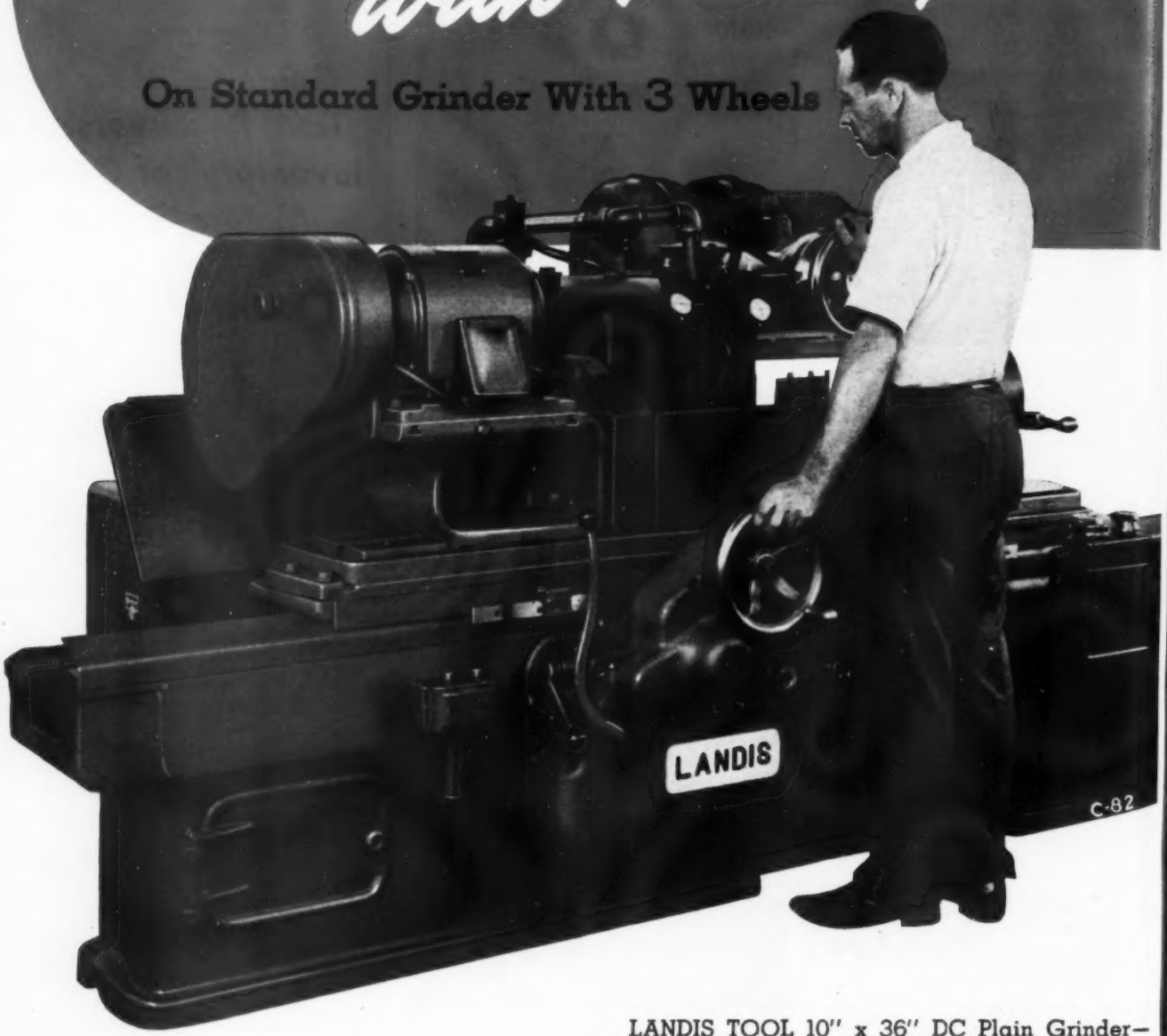
Attn. of Mr.....

HEAR THE BOSTON SYMPHONY: *Saturday, American Broadcasting Co.*

4 Grinding Operations

with 1 Setup

On Standard Grinder With 3 Wheels



LANDIS TOOL 10" x 36" DC Plain Grinder—Standard machine plus 2 extra wheels, work arbors, wheel truing fixture, work driver, work cradle, visual sizing gauge, and hydraulic rapid infeed.

LANDIS TOOL CO. • WAYNESBORO, PENNA.

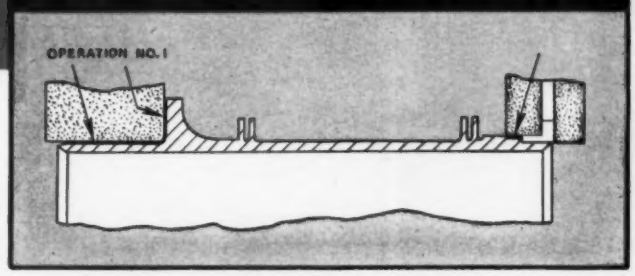
Cuts Setup time 75%
Grinding time 50%

Another Example of Landis Tool Engineered Grinding Service

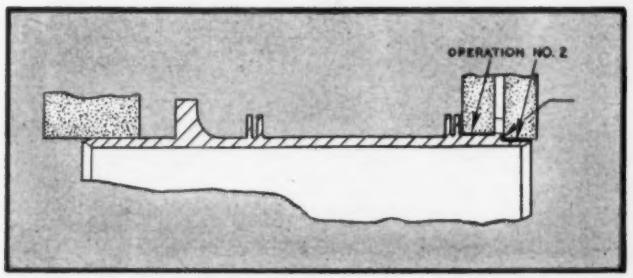
THE PROBLEM

To grind three diameters and an adjoining shoulder of a cylinder in large volume production.

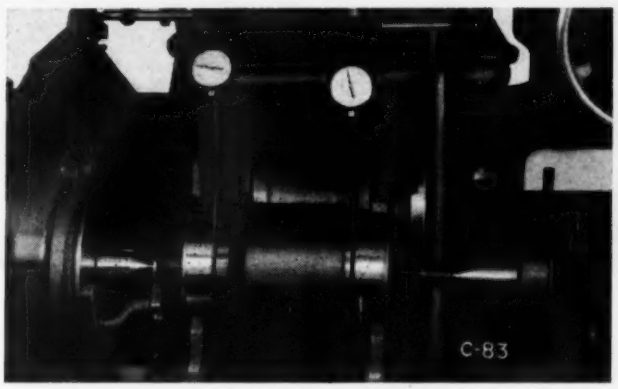
THE LANDIS TOOL SOLUTION



Starting with a standard 10" x 36" DC Plain Grinder, LANDIS TOOL engineers mounted 3 wheels on the same spindle. The widest diameter and adjoining shoulder were ground first by the 24" x 2½" wheel.



The two adjacent diameters were then ground by the 24" x ⅞" wheel and the 23¾" x ⅞" wheel.



Grinding setup with wheel in position for grinding diameter and adjoining shoulder.

Here is another example of how grinding problems can be solved with standard machines tailored to the job. With four grinding operations on a cylinder LANDIS TOOL engineers mounted three wheels on the same spindle so that the job could be done with a single setup. This was made possible by the massiveness of the machine itself. In addition to savings of 75% in setup time, there were further savings made in grinding time. By combining the diameter and adjacent shoulder in one operation and the two stepped diameters in another operation together with the use of the hydraulic rapid infeed, grinding time was reduced more than 50%.

Many production grinding problems lend themselves to an equally economical and cost reducing solution. If you have a grinding problem, call on LANDIS TOOL for Engineered Grinding Service.

43

LANDIS TOOL
Precision Grinders

"AS OLD AS

THE AMERICAN TOOL WORKS

S METHUSELAH"

BUT STILL ON THE JOB...

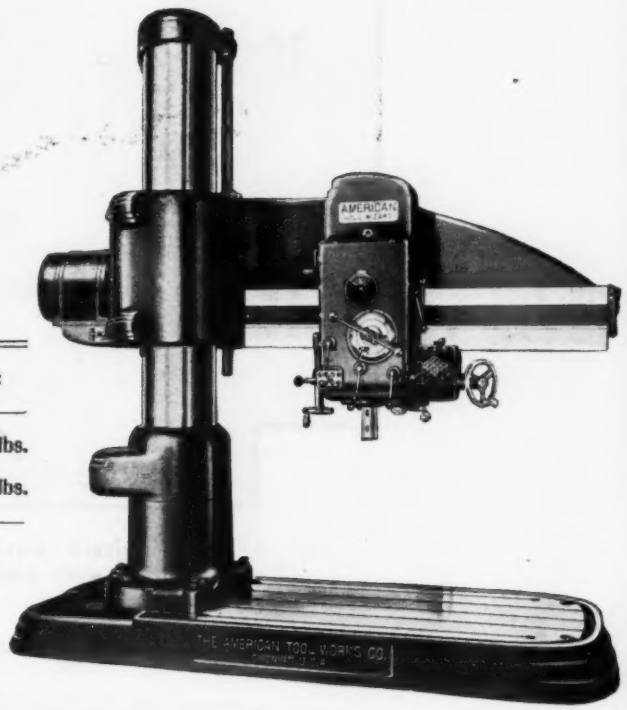
This War Department Photograph shows this 30-year-old "American" Radial still on active duty.

Doubtless it is expedient, during an emergency, to press usable machines into service in spite of their age, but such practice should be abandoned the instant that the emergency has passed. It is just too costly a practice for peacetime economy.

Unfortunately there are entirely too many machines of this vintage still in operation in metal working plants right here in our own country. They will have to be replaced with modern equipment just as quickly as possible if the low cost demands of the future are to be met.

Now compare the new 1945 model with its 30-year-old prototype and you will immediately see why these older models cannot be profitably used today.

	No. of Spindle Speeds	Top Spindle Speed	No. of Feeds	H. P. Motor Used for Driving	Weight
945 Model.....	32	2000 r.p.m.	16	15	13,000 lbs.
914 Model.....	12	500 r.p.m.	4	5	7,000 lbs.



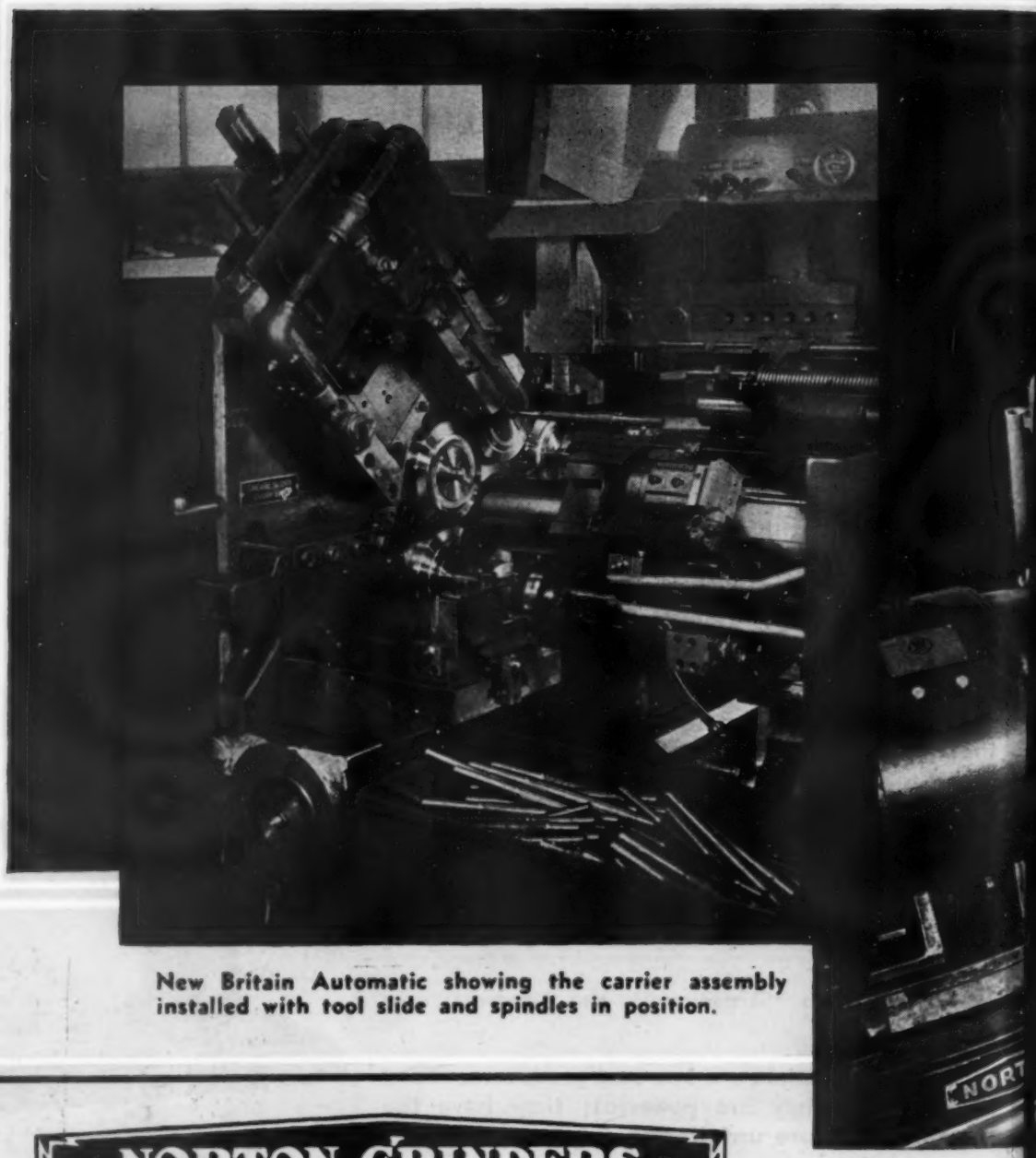
Modernize with "American"—the "newest new radial".

"American" Radials are low cost producers. They are modern; they are powerful; they have the stamina to insure unfaltering operation.

Send for descriptive literature

S *Lathes and Radial Drills* **Cincinnati, Ohio U.S.A.**

ACCENT ON *Accuracy*



New Britain Automatic showing the carrier assembly installed with tool slide and spindles in position.

NORTON GRINDERS *and Lappers*

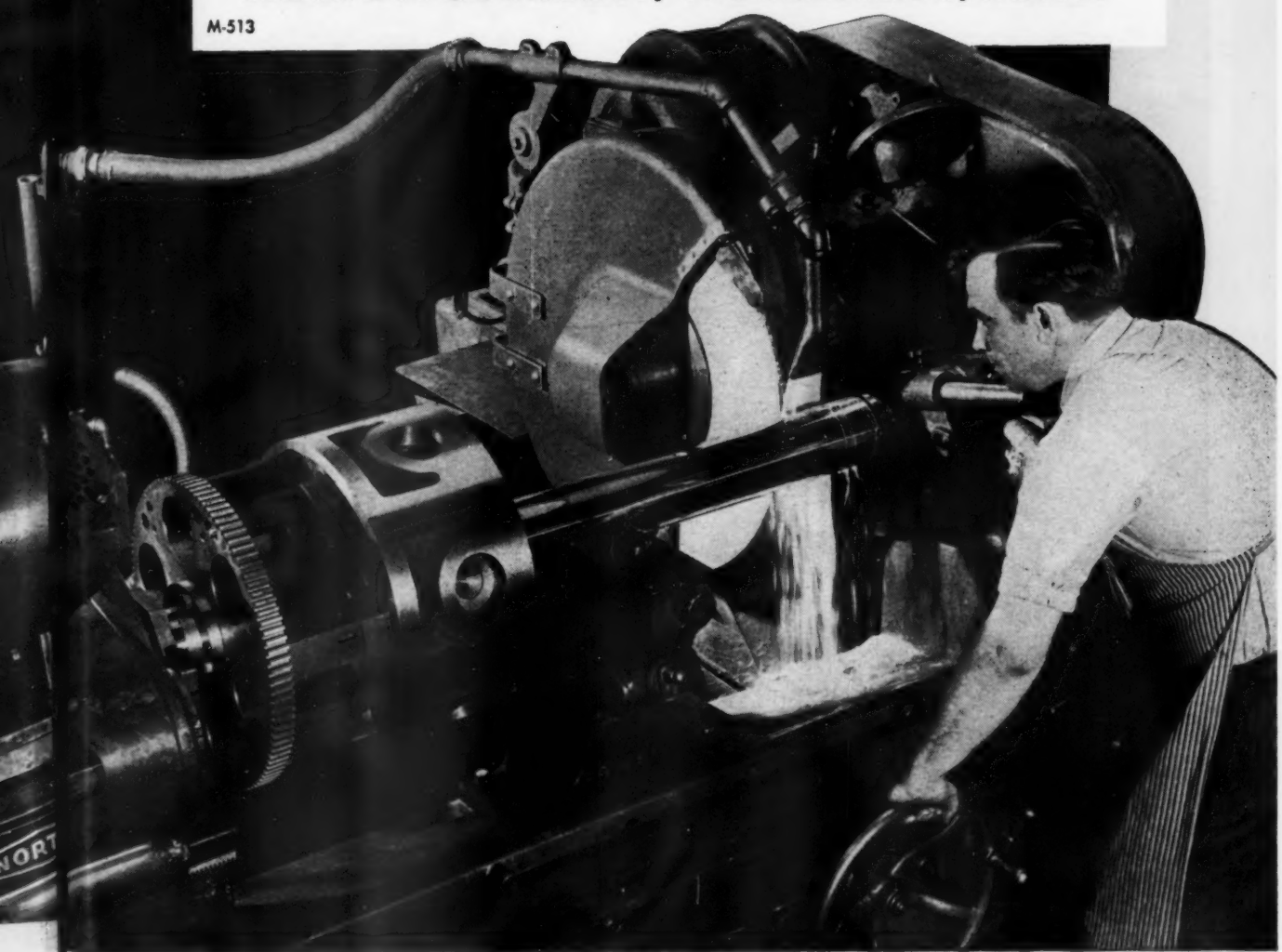
THE finish grinding operation on the spindle carrier stem of a New Britain Automatic Screw Machine requires the holding of size, roundness and parallelism within one ten thousandth of an inch — and a finish of 3 to 5 microinches.

For this exacting work, a Norton 16" Type C Grinder using a Norton 37C500-G8B fine grain wheel was chosen.

Engineered to produce this, or similar fine work, on a steady day-to-day basis, Norton Grinders are contributing their outstanding capacities to production grinding for many industries. Norton Engineers will be glad to study your new production problems and show what Norton Grinders and Lappers can do to lower costs.

NORTON COMPANY, WORCESTER 6, MASS.

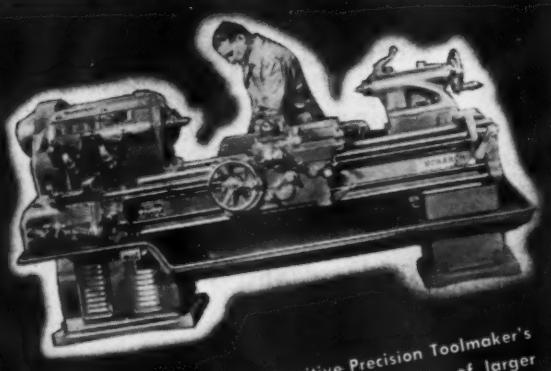
M-513



Finish grinding carrier stems on a Norton machine 16" x 36" gap arranged. The carrier is also finish ground in this same set-up — concentric with the stem within .0001".

Monarch gives the

New Monarch 10" Sensitive Precision Toolmaker's Lathe has been refined and improved to still greater accuracy and ease of control, even beyond the prewar model. Flame-hardened and ground bedways assure long-time, high-quality performance.



In addition to the 10" Sensitive Precision Toolmaker's Lathe, Monarch provides a complete line of larger toolroom machines, from 12" to 20". These are an entirely separate line from similar sizes of heavy-duty production turning machines, but include the well-known Monarch features for faster, more accurate machining.

Improved Monarch Magna-Matic, fully automatic, all-electric turning machine, incorporates latest developments in electrical controls. One button control of automatic cycle. Equipped with 6 to 1-spindle slow-down for use with rear carriage, and with automatic feed changes.

New Monarch 10" Precision Manufacturing Machine for fast, extremely accurate production of small parts. Spindle speeds up to 4,000 rpm or higher when needed. 6 to 1 back gear for increasing spindle speed range or for developing power for heavier cuts. Bench precision accuracy for mass production.

voters what they want!

HERE'S HOW THEY VOTED!	
Hardened and ground bedways	79.4%
More accessible controls	80.0%
Full electric controls	48.9%
Capacity for closer tolerances and finer finishes	69.1%
Centralized lubrication	85.6%
More freedom from vibration	60.6%
Built for carbide tooling	79.0%
V-belt drives	69.4%
Cast bases	42.9%

The accompanying table shows what buyers want in machine tools, according to polls taken by trade publications.

We're glad this was a completely neutral survey, because of the way Monarch turning machines meet the requirements, right on the nose.

Another count of the most valuable and practical features of turning machines would, we suspect, show many votes for such Monarch time-saving and money-saving improvements, as:

High-speed toolroom and production lathes
Ball-bearing taper attachments
Automatic sizing machines
Magna-Matic all-electric machines
Shapemaster for turning unusual shapes
Quick-change spindle speeds
Cost-saving accessories

When you combine Monarch's basic qualities and these outstanding developments, you'll find the reasons for Monarch's continued success among those who buy machine tools for faster, better, more economical production. Our engineers will help you select the right Monarch machine for your specific job.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 3355

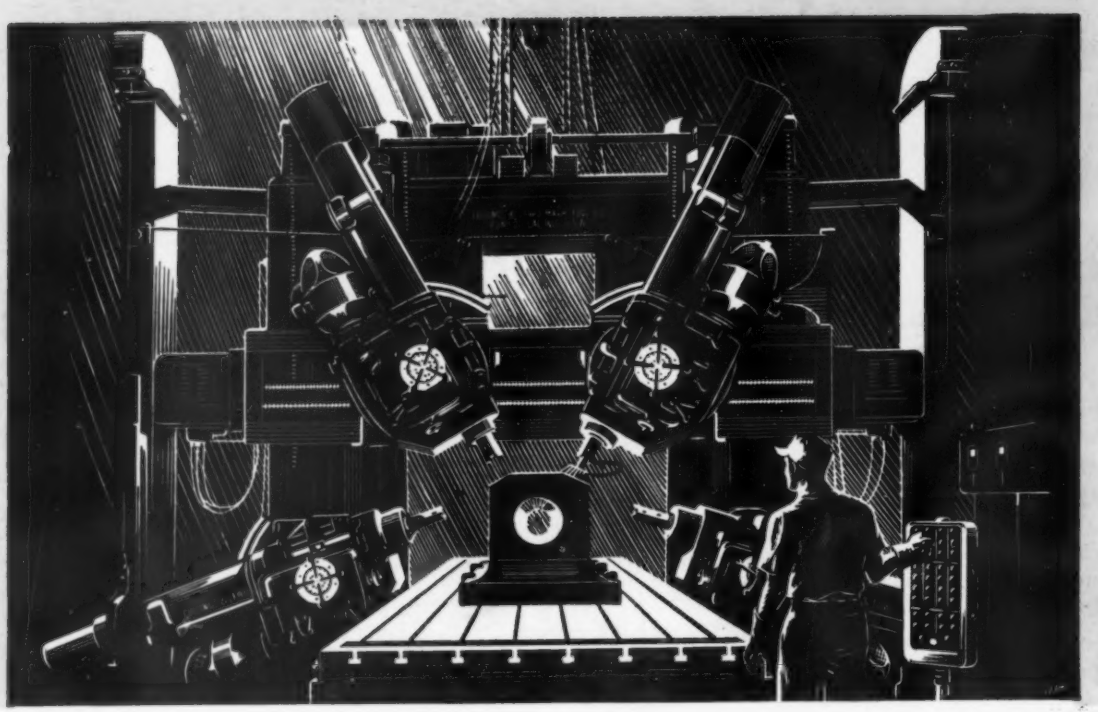
NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES



A foursome WITH A GENIUS FOR ANGLES

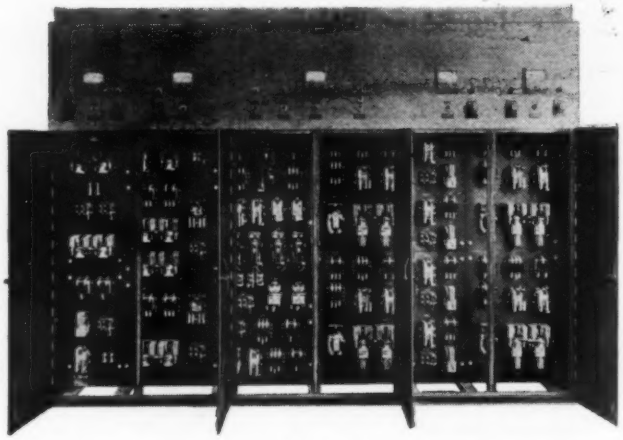
One sure way to cut costs on high-run difficult machining operations is to give a machine tool four different heads — working automatically from one centralized control.

This remarkable machine tool*, now operating in a large naval yard, is a marvel of machining flexibility. It performs three separate functions—milling, boring and drilling. All four heads can be swung through a wide arc to obtain any work angle, thus making difficult cuts a routine function.

The job of controlling and operating the four heads is a 100% Westinghouse job. Twenty motors—electrically interlocked to guarantee safe operation—supply individual drive power for each motion.

The Westinghouse control pictured at the right is fully magnetic and completely interlocked. All motors are of the constant-voltage type, and use 65 kw in normal operation. Result: the fastest machining time for a vital naval machining operation yet achieved by any machine tool!

*Built by Giddings & Lewis Machine Tool Co., Fond du Lac, Wisc., U. S. A.



This application of individual motor drive is only one of the many examples of how Westinghouse has put the "machine" in machine tools, through efficient machinery electrification. This "know-how" can save you time—and money. For complete assistance, call your Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-94694

Westinghouse

PLANTS IN 25 CITIES OFFICES EVERYWHERE

THE MACHINE IN MACHINE TOOLS

The Leader in it's field

MODERN SELF-OPENING STUD SETTERS

Used by practically every automobile, truck, tractor, diesel engine manufacturer and others with studs to set in quantity.

The three simple MODERN steps to speed, economy, and convenience in stud setting are illustrated at the right.

At the top . . . jaws open to take the stud.

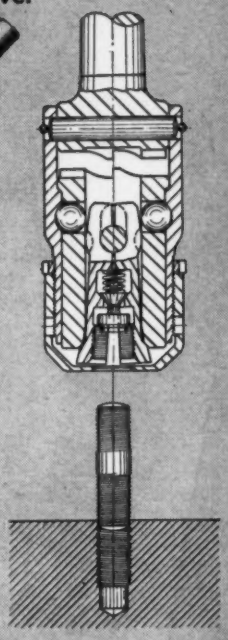
Middle . . . driving position, jaws locked on stud.

At the bottom . . . stud driven to full depth. The stop collar contacts the work and releases the clutch. Lifting the tool opens the jaws.

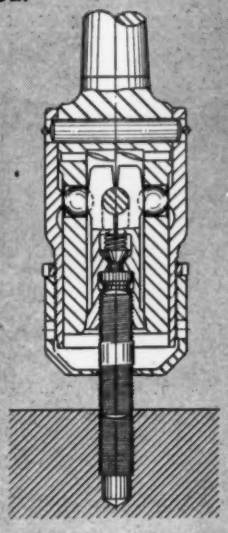
The tool revolves in one direction, no reversal, for the complete job.

As the action of the tool is positive and automatic, it can be operated in any position with either air or electrically operated portable tools. It can also be used in a drill press, where it is possible to drill and tap the holes and set the studs in successive operations.

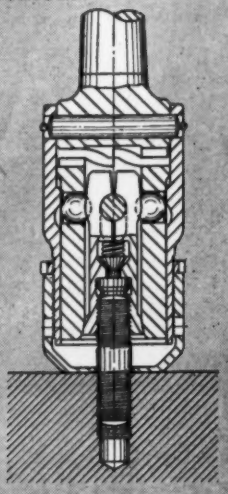
Tool brought to position over stud, about to begin drive.



Start of the drive, with tool engaged on the stud.



Drive completed, with clutch released.



Write for detailed information on the Modern Stud Setter. You will be interested in how and why it provides a proved means for stepping up your production.

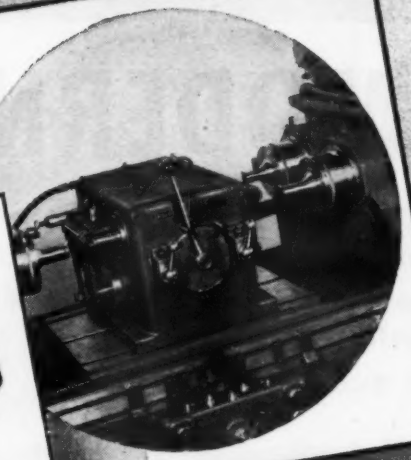
MODERN TOOL WORKS

DIVISION OF
CONSOLIDATED MACHINE TOOL CORPORATION
ROCHESTER 10, NEW YORK

A File of EX-CELL-O

FIXTURES

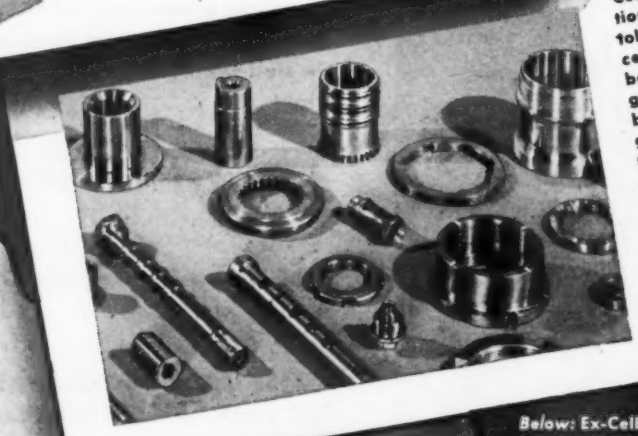
To right: Typical set-up designed and made by Ex-Cell-O for standard boring machine. Used to semi-finish both ends of steel articulated rod at a high production rate with maximum efficiency and economy.



CONTINENTAL STANDARD and SPECIAL CUTTING TOOLS (High Speed and Carbide)

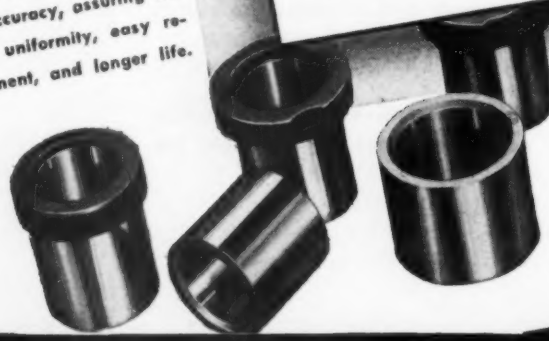
PRECISION PARTS

The machining of hardened and ground precision parts "to aircraft accuracy" is another Ex-Cell-O specialty. Operations performed to close tolerances and with exceptional finish include boring, turning, facing, grooving, chamfering, broaching, and thread grinding. Ex-Cell-O's extensive production of precision parts, using Ex-Cell-O precision machines and cutting tools, has increased output in the aircraft and other industries without sacrificing high accuracy standards.



DRILL JIG BUSHINGS

Ex-Cell-O drill jig bushings (A.S.A. Standards) are made with accuracy, assuring absolute uniformity, easy replacement, and longer life.



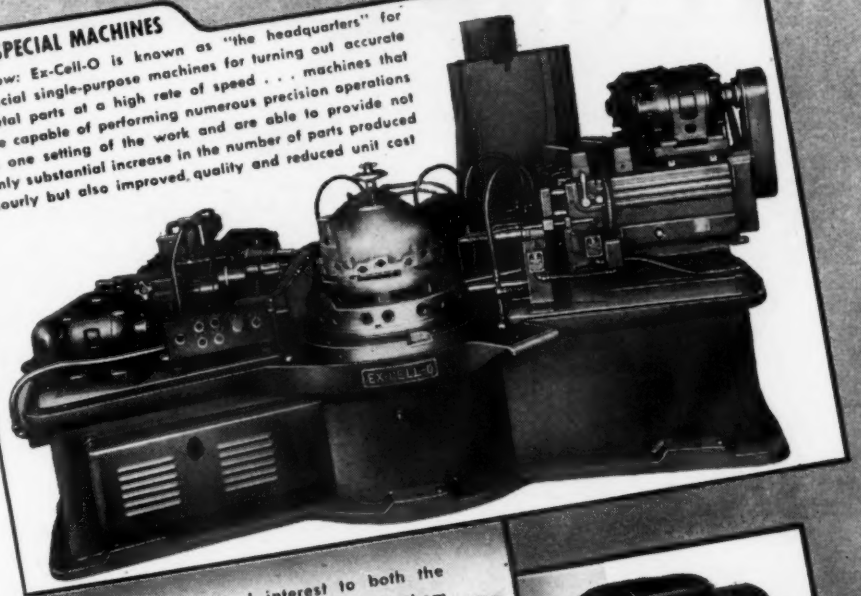
Below: Ex-Cell-O's new catalog on precision machine tools, cutting tools, and other Ex-Cell-O precision products. Contains illustrations, descriptions, and specifications. A copy will be mailed free to any executive requesting it on his business letterhead. Ask for Ex-Cell-O Catalog No. 27121.

SPECIAL MULTIPLE WAY-TYPE PRECISION BORING MACHINES • SPECIAL MULTIPLE PRECISION DRILLING MACHINES • PRECISION THREAD GRINDING, BORING AND LAPPING MACHINES • BROACHES AND BROACH GRINDING MACHINES

Production Aids

SPECIAL MACHINES

Below: Ex-Cell-O is known as "the headquarters" for special single-purpose machines for turning out accurate metal parts at a high rate of speed . . . machines that are capable of performing numerous precision operations in one setting of the work and are able to provide not only substantial increase in the number of parts produced hourly but also improved quality and reduced unit cost

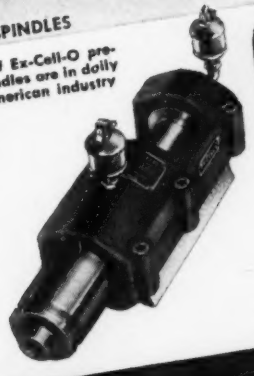


STANDARD MACHINES

Ex-Cell-O precision machine tools—for boring, turning, facing, thread grinding, broach sharpening, tool grinding, lapping—are sound in design and construction. The simplicity of their operation and the substantial production they attain on an economical basis, make these Ex-Cell-O standard machines of practical interest to both the manufacturers who install them and to the men who operate them.

GRINDING SPINDLES

Many thousands of Ex-Cell-O precision grinding spindles are in daily use throughout American industry



HYDRAULIC POWER UNITS

They provide an economical method of drilling, reaming, countersinking or spot-facing. Also may be used as prime movers or drivers for other machine units.

XLO

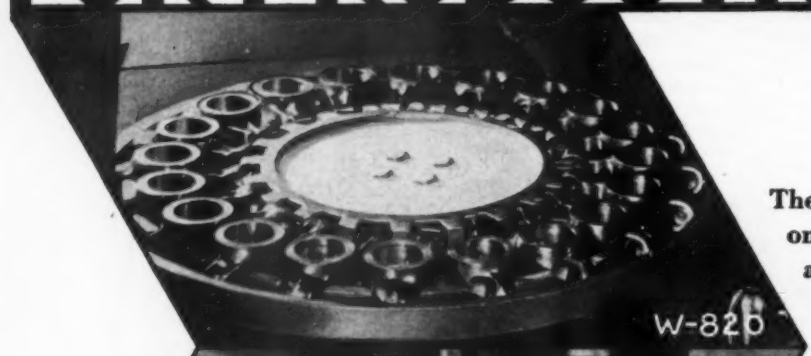
EX-CELL-O *for* PRECISION

IN your production plans for now and the future, take advantage of Ex-Cell-O's substantial background of practical engineering experience in the designing and manufacturing of precision machine tools and Continental cutting tools. Send today for General Products Folder No. 27132.

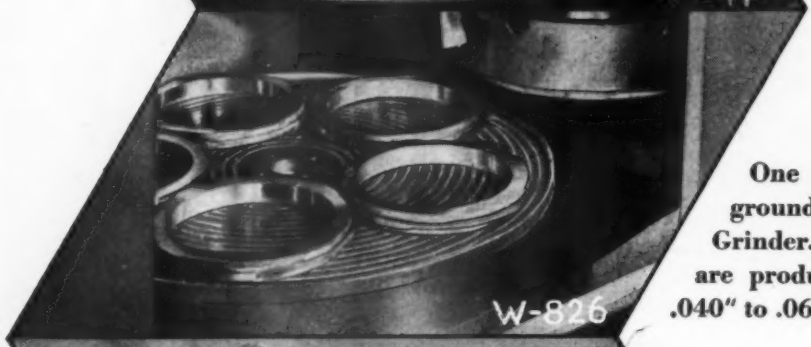
EX-CELL-O CORPORATION • DETROIT 6

HYDRAULIC POWER UNITS • GRINDING SPINDLES • DRILL JIG BUSHINGS • CONTINENTAL CUTTING TOOLS • TOOL GRINDERS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PURE-PAK MILK CONTAINER MACHINES • PRECISION AIRCRAFT AND MISCELLANEOUS PARTS

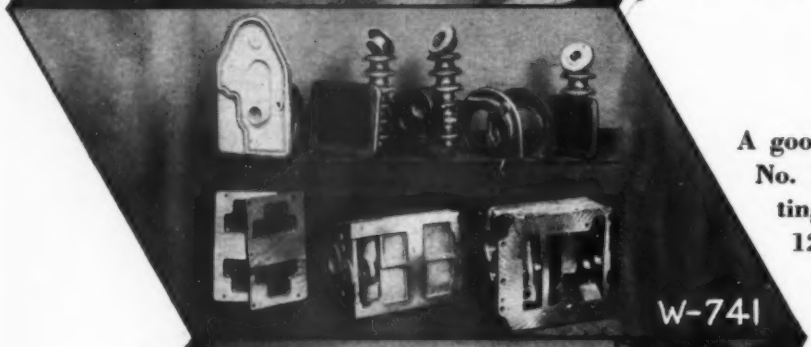
FOR PRODUCTION PUT IT ON THE BLANCHARD



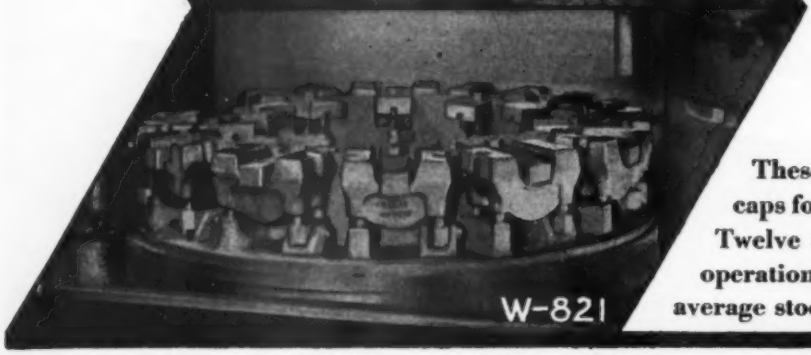
These steel forged rocker arms are ground on a No. 11 Blanchard Surface Grinder and 1800-2000 pieces are produced per eight hour shift, stock removal .005" to commercial limits.



One of many airplane engine parts ground on the No. 18 Blanchard Surface Grinder. 109 of these nickel steel cams are produced per hour, stock removal .040" to .060", to ± .001".



A good example of the way Blanchard No. 18 Surface Grinders are eliminating hand scraping. Fifteen Gear boxes 12" x 12" x 3" or 30 surfaces are ground per hour, removing .070" each side for oil-tight joints.



These nickel steel forgings are bearing caps for the master rods of radial engines. Twelve of these caps are ground in one operation requiring only 27 minutes, average stock removal .075".

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

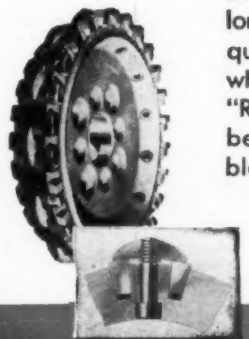
BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

. . . is the Word for *Continental* Inserted Blade Face Milling Cutters

• Continental Type "R" Inserted Blade Face Milling Cutters and Shell End Mills have hardened cutter bodies and are practically indestructible. This prevents mutilation of blade slots and permits accurately ground and hardened surfaces for contact with machine arbors. Continental Cutter bodies have no screw threads or serrations to wear out, strip or become plugged. Wedge shaped blades are securely held in place by positive clamp lock . . . are easily removed without injury to blade or carbide tip. Continental Type "R" blades are longer, giving more grinds per blade. Blades can be quickly and individually adjusted. This reduces waste when carbide tipped blades are used. Continental Type "R" cutters are available in a wide range of sizes. Can be furnished with carbide tipped or high speed steel blades—in positive or negative rake. Continental Type "R" cutters "can take it." For lower tool cost on "tough" jobs specify Continental Type "R" Cutters.



CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Continental
CUTTING TOOLS

- Boring Bars and Tools
- Broaches
- Broach Pullers
- Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

If You're Asking These Questions About
RECONVERSION INVENTORY

What do we do first?
How can we tell if the units okay?
Where do we begin?
Who should handle the job?
What do we need to start?
How can we keep our parts stock small?
Can we tell in advance where trouble will be?
What are the tolerances?

...Get This Helpful Kit FREE!

Covers all makes of motors, pumps, and v-belt drives

AS YOU RECONVERT to peacetime production—competitive production in which every unit *must* operate at top efficiency—you'll have to know what present equipment you can use. You'll want to weed out wartime makeshifts, match the right unit to each job. You'll need to take inventory. Allis-Chalmers' free Reconversion Inventory Kit—covering all makes of electric motors, centrifugal pumps, and v-belt drives—will speed this work. It outlines entire procedure, states standards and formulae, includes simple check list appraisal charts. Call your A-C distributor or district office, or mail the coupon to ALLIS-CHALMERS MFG. CO., MILWAUKEE 1, WIS.

ALLIS (AC) CHALMERS

HEAR THE BOSTON SYMPHONY: *Saturday, American Broadcasting Co.*

A 1945

ALLIS-CHALMERS, Dept. A.M.
Milwaukee 1, Wis.

Send us the free Reconversion Inventory Kit covering motors, centrifugal pumps, and v-belt drives.

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Address.....

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Attn. of Mr......

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

A technical magazine states that the war-developed arc-oxygen electrode will cut quarter-inch steel plate at the rate of a foot per second while under 40 feet of water. *Metal and Thermit Corp.*

get ready with CONE for tomorrow

It is estimated that within a few years 80% of the coal mined underground will be removed from the mines on conveyor belts instead of in cars. *Scientific American.*

get ready with CONE for tomorrow

The PV-3 helicopter has a long fuselage with a rotor on each end and carries twelve persons. It is being tested by the Coast Guard and Navy. *Popular Science.*

get ready with CONE for tomorrow

A new cement, for use in concrete flooring, is said to drive away insects, kill bacteria, and prevent the formation of molds. It also dissipates static electricity. *H. H. Robertson Co., Pittsburgh.*

get ready with CONE for tomorrow

An appliance manufacturer announces an electric washing machine that can also, by the use of attachments, wash dishes, peel potatoes, churn butter, and freeze ice cream. *Hurley Machine Division Elec. Household Utilities.*

get ready with CONE for tomorrow

A new gasoline-powered lawn mower resembles a floor scrubbing machine. It is mounted on four wheels and uses a rotary knife revolving at 3,000 r.p.m. *Whirlwind Lawn Mower Corp., Milwaukee.*

get ready with CONE for tomorrow

The manufacturer of the jet engine used in the P-80 Shooting Star prophesies that all transcontinental planes will be jet-propelled within five years. *General Electric.*

One of the war devices that may survive to help the motorist is the tire gauge that registers on the dash, developed for the Army's amphibious "duck." *GMC Truck and Coach Div.*

get ready with CONE for tomorrow

A magnetic survey of the state of Florida shows large areas in the southern part that are favorable for the occurrence of petroleum. *U. S. Dept. of Mines.*

get ready with CONE for tomorrow

Meals are being served in the Naval Air Transport Service that are pre-cooked, packed in a covered paper plate and frozen. On the plane they are thawed and heated in a special oven. *Maxon Sky Plate, W. L. Maxon Corp., 460 W. 34th St., New York.*

Air conditioned trolley cars are being introduced in a Southern city. This is said to be the first use of such equipment in city vehicle transportation. *Atlanta, Ga.-Pullman-Standard.*

get ready with CONE for tomorrow

A new household electric light switch can be set for delayed action up to three minutes. *T. J. Mudon Co., 1240 Merchandise Mart, Chicago.*

get ready with CONE for tomorrow

Rubber V-belts molded around a steel cable have been developed to replace chain drive on Army motorcycles. *Goodyear, Akron 16, Ohio, Whizzer Motor Co., Los Angeles.*

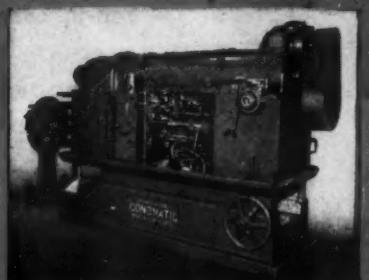
get ready with CONE for tomorrow

Even the common wire nail has been improved. The new type has a notch in place of the point and is claimed to be non-splitting. *E. S. Gair, Snyder, New York, inventor.*

15 operations in 12 seconds

The 15 operations that form this washing-machine part of B-1112 steel, including rolling the oil groove* in the outside diameter, are performed by the 8-Spindle Conomatic in 12 seconds.

*Write to Cone for particulars



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

24

He wants a JOB . . . and fast!

The world's finest BORING and milling machine.

WRITE TODAY for your descriptive bulletin.

Create Jobs Faster by Speeding up your Reconversion Tooling

with a

DeVlieg JIGMIL

USERS report two to three times the output with greatly improved accuracy as compared to other methods.

AUTOMATIC PRECISION . . . Automatic positioning between holes is controlled within less than one ten-thousandth part of an inch . . . feather touch pressure controlled slide locks positively control locking uniformity after positioning . . . all functions are responsive to the centralized finger tip control.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

Announcing the **KEARNEY & TRECKER**

Milwaukee

Precision Milling and Boring Machine

No. 3 MODEL T

Precision Milling plus Precision Boring — performed in one setting of the workpiece — results in greater accuracy in the finished product. That is the contribution this machine offers to economical production of parts requiring precision milling and boring operations.

Developed by Kearney & Trecker engineers to provide a faster and more accurate method of highly precise milling and boring in one setup, the Kearney & Trecker Precision Milling and Boring Machine embodies these basic features:

- Precise machine alignments and measuring devices to assure highly accurate results.
- A wide range of speeds and feeds are available for the efficient use of modern cutting tools on a wide variety of operations.
- A No. 50 National Standard spindle nose that accommodates modern milling and boring tools.
- Centralized boring head controls, dual table controls and a swivel control pendant provide for easy and rapid operation.

Again Kearney & Trecker engineers have proven their skill in the design and proportioning of this machine tool. Constructed on the unit plan this machine is characterized by its rigidity — ease of operation — and precise results. Write for descriptive catalog No. T10.

BUILDERS OF MILWAUKEE ROTARY HEAD MILLING MACHINE • MIDGETMILL • SPEEDMILL • FACE MILL GRINDER • AUTOMETRIC BORING MACHINES

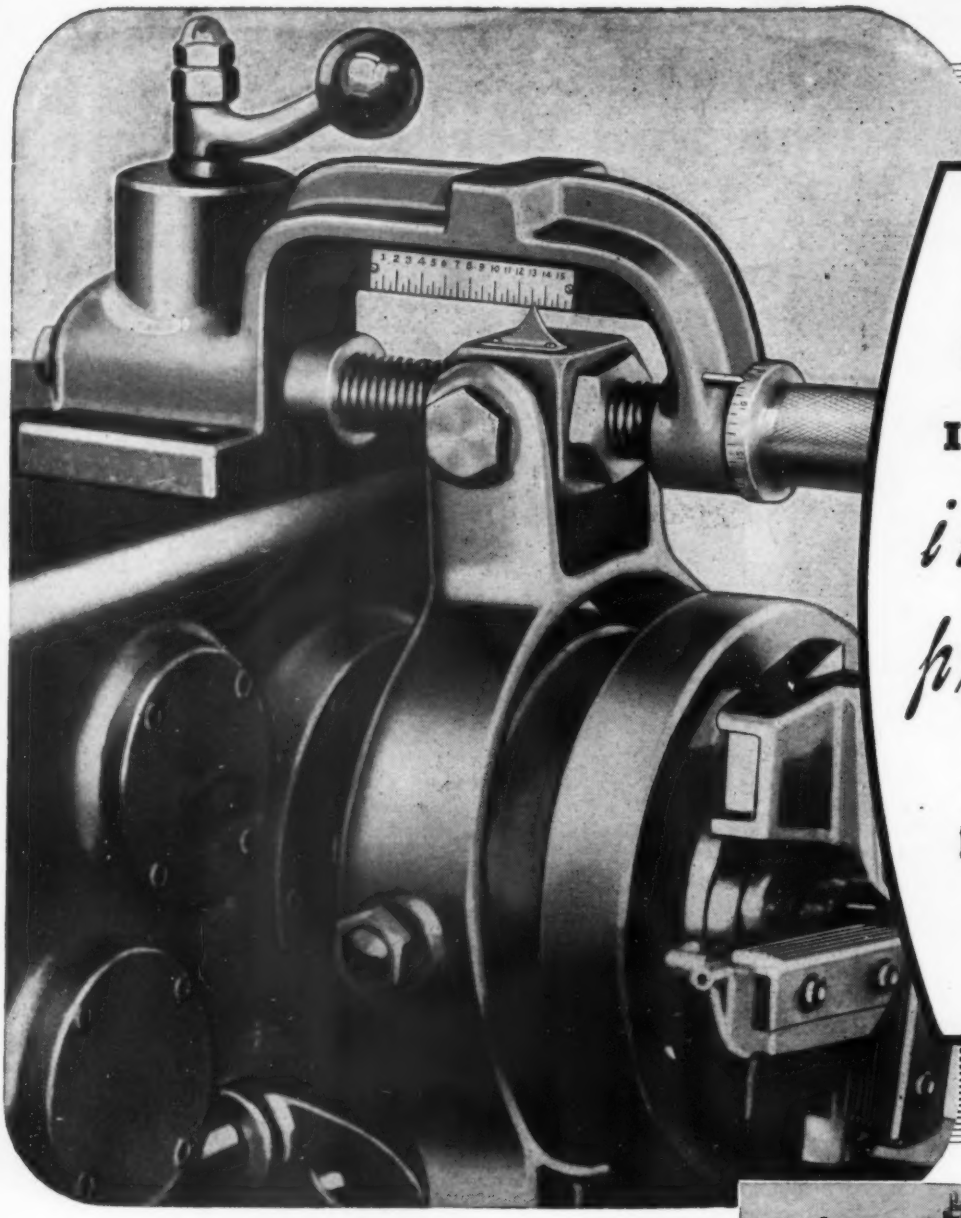
Kearney & Trecker

Products

CORPORATION

MILWAUKEE 14, WISCONSIN

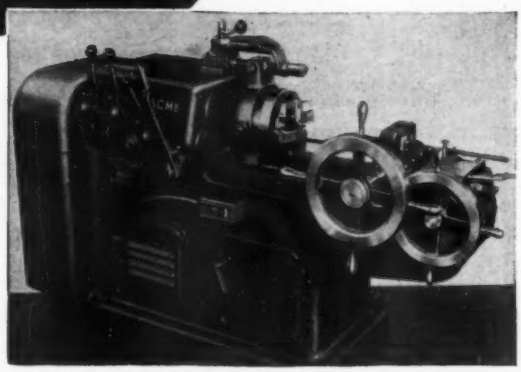
Subsidiary of Kearney & Trecker Corporation



THIS PRACTICAL IMPROVEMENT *increases production* ON MULTIPLE CUT THREADING

By simply moving the ball handled lever on top of the Acme XL Threading Machine, the depth of cut is automatically determined and registered on the graduated rule without stopping rotation of head. One or more roughing cuts can be taken with the assurance that the final finishing cut will be accurate according to the setting on the calibrated dial of the Acme XL micrometer adjustment. Here is a practical improvement that will increase production on coarse pitch threading.

Acme XL Threading Machines are built in single spindle from 1" to 3" inclusive; double from 1" to 2½" inclusive. For more information, write today for bulletin XL-3.



The Acme XL Threading Machine

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 4535 St. Clair Ave. Cleveland 14, Ohio
ESTABLISHED 1882

FORGING · THREADING · TAPPING · BOLT · NUT · RIVET MACHINES • ALSO MANUFACTURERS OF HILL HYDRAULIC SURFACE GRINDERS • "CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES

HER GREATEST NEED IS YOURS TODAY

This seventy foot animal even at birth
Had very small teeth and a very large girth.
The teeth were too small to chew enough hay
To keep the great body from wasting away.

With twenty ton weight you can easily guess
Her powers might compare to a Minster press.
She couldn't make dies; Jigs; or special machines
And with them extractors to boil down her greens.

So lacked her extractor for vitamin pills
Which need not be chewed, and would cure all her ills.
And this is the reason, the scientists think,
The great pre-war dinosaurs now are extinct.

The moral of this (we could go on for hours)
That specialized tools will extend all our powers.
The better your tools in the post-war revival
The more your success and your chance of survival.

THE VULCAN TOOL CO.

730 LORAIN AVE.,
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ENGINEERING • PROCESSING • DESIGNING • [illegible]
SPECIAL TOOL AND MACHINERY MANUFACTURING [illegible]

RUST S-TEALS MONEY

Stop it!

Those millions of dollars stolen annually by rust's scaly fingers . . . why let them be your dollars? Stop the rust thief in your plant!

Sinclair preventives that helped solve the war's tremendous rust problems are available to end *your* rust troubles. Whether it be protection for

- machinery in regular operation,
- machinery in short-time or extended storage,
- machinery in transit,
- piping, shafting, etc., exposed to corrosion,

there's a Sinclair *war-tested* preventive that *stops* rust . . . extends equipment durability . . . lengthens the life of metal installations.

Sinclair rust preventives are easily applied, easily removed – and they protect both internal and external surfaces.

Write us for information about application of Sinclair Opaline* RP Oils, and Sinclair Rust-O-Lene* rust preventives to your problems.

*Reg. U. S. Pat. Off.

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FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

Where can YOU use this amazing new *VIBRATORY* ram action?

(Oil-Hydraulic)

Ram action that permits short, rapidly-repeated uniform pressure strokes of regulative length, frequency, pressure and number per ram cycle

● So many startling advantages have been found in this new *exactly-controlled vibratory ram action* that, thus far, even we know only a few of its potential applications. Performance tests indicate that it may *revolutionize* scores of operations!

If your production includes *any* operation which you think might be improved by rapidly-repeated, uniform-pressure strokes, Denison engineers will be glad to adapt Vibratory HydrOILic Pressure to your specific needs! Write for information today!

* * *

This new vibratory hydraulic pressure principle is available in the equally amazing Denison Multipress—a four-ton and six-ton bench-size oil-hydraulic machine tool that performs almost any type of production operation calling for controlled pressure. *Let us send you the latest, fully-illustrated bulletin on* MULTIPRESS.

The DENISON Engineering Co., 1164 Dublin Road, Columbus 16, Ohio

DENISON
EQUIPMENT for APPLIED
HydrOILics

HydrOILics
INDUSTRY'S RIGHT HAND

Using a special rotary fixture, the Le Roi Company taps Class 4 threads in one operation on a Warner & Swasey No. 12 Precision Tapping and Threading Machine.

CLASS 4 THREADS AT ONE PASS!

AND SCRAP LESS THAN 1%

ONE stage of production at the Le Roi Company, West Allis, Wisconsin, manufacturer of industrial gasoline engines, calls for an important and highly accurate tapping job on crankshaft flanges. The ½-20 thread calls for a Class 4 fit through a 5/16" flange. Under former methods—a rough tap by machine and then finish by hand—up to one crankshaft in every ten was scrapped.

Today, by installing a Warner & Swasey No. 12 Precision Tapping and Threading Machine, Le Roi has cut scrap losses to the vanishing point (less than 1%). This accurate machine taps the Class 4 fits in a single operation, and eliminates all costly handwork.

Before the war, it would have been considered impossible to cut Class 3, 4, and 5 threads consistently by machine alone. Today, the results at the Le Roi Company bear out the experience of plant after plant in proving that Warner & Swasey Precision Tapping and Threading Machines set new standards of accuracy.

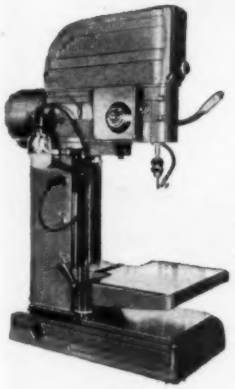
If you have a tough tapping or threading job, in hard or soft metals or plastics, let a Warner & Swasey Field Engineer show you how a Precision Tapping and Threading Machine can help you cut scrap losses, get better production and make more profits. Or write Warner & Swasey direct for a catalog describing all four models.

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS...WITH A WARNER & SWASEY

WARNER & SWASEY Machine Tools *Cleveland*

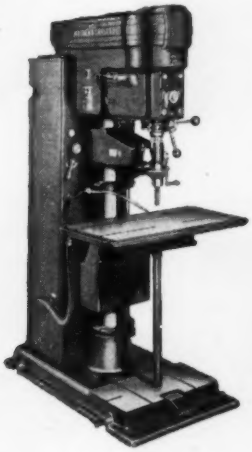
TURRET LATHES, SADDLE AND RAM TYPES • CHUCKING AND BAR TOOLS • PRECISION TAPPING AND THREADING MACHINES

No. 10, Capacity 0-80 to 10-24



No. 11, Capacity 8-36 to 5/8"

No. 12, Capacity 3/8" to 2½"



No. 11R, Radial Capacity 8-36 to 5/8"

Snyder CAN DO YOU A GOOD TURN ON SPECIAL LATHES

Here are four center-driven lathes designed and built by Snyder to combine maximum production and accuracy with minimum handling in processing large heavy parts.

A. (No. 42595) A prewar machine for processing fabricated steel axle shaft housings for trucks. Center drive unit is small with short rear center movement actuated by air cylinders. Tail stock housing is rigidly mounted. Operations; turning various diameters near the wheel ends of the housing and facing numerous shoulders and flanges.

B. (No. 47826) Basically the same as Machine "A" but built to handle heavier, cast parts. Operations; turning with front tool blocks, facing and shouldering with rear tool blocks—which are reversible for rough or finish facing. Tail stop assembly slides in and out of work as an assembly.

C. (No. 43218) Essentially the same as Machines "A" and "B" but built to handle a cast armor plate rotor and designed with considerable travel of tail stock to provide loading space. Operations are turning and facing from both ends.

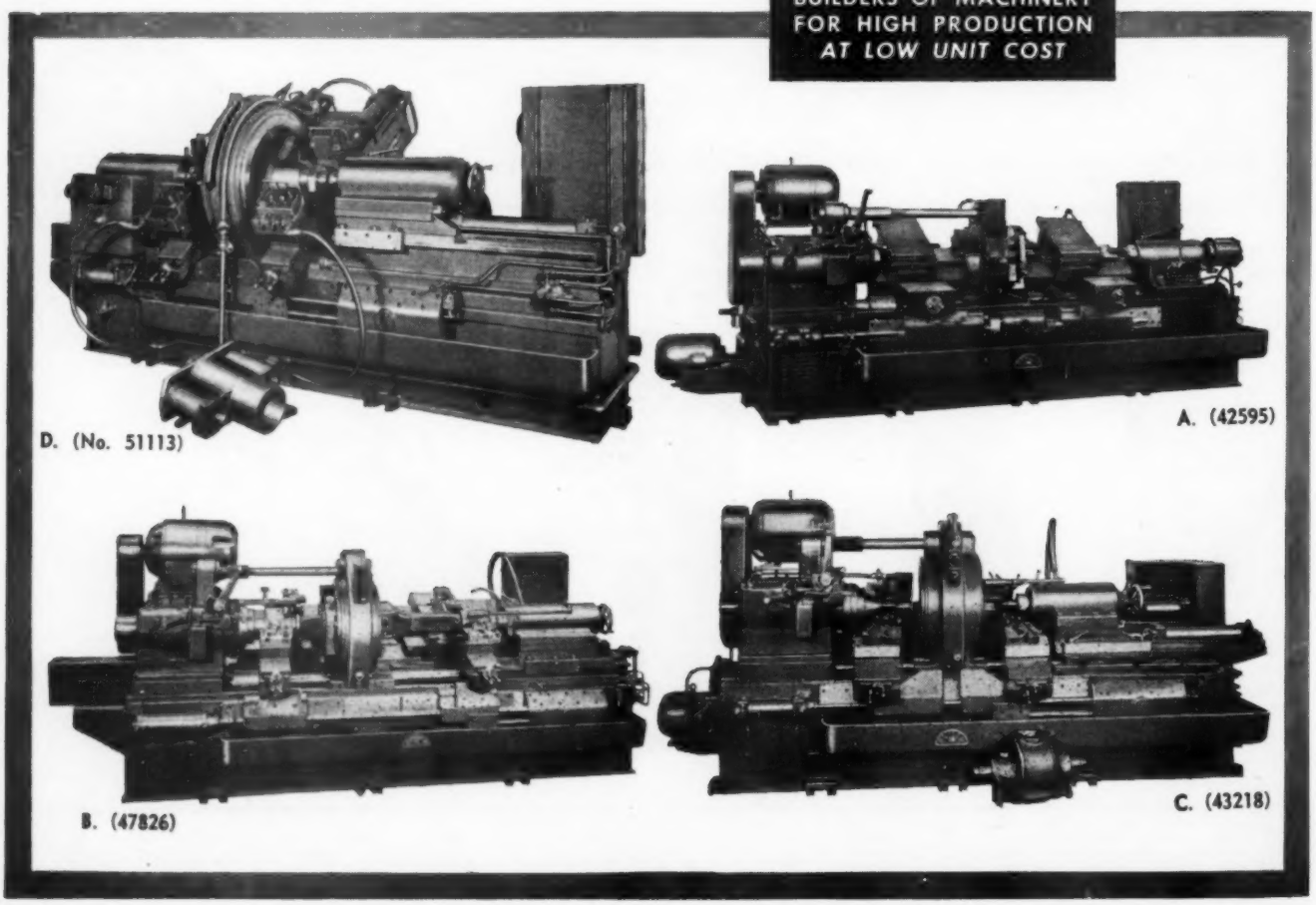
D. (No. 51113) For processing cast armor plate recoil housings. Rear tool slides have extremely long travel and conventional head stock and motor drive to center drive have been eliminated. Center drive is direct from motor and transmission in rear of machine. Operations; turning with front tool blocks and facing and shouldering with rear tool blocks.

All of these lathes are hydraulically operated and electrically controlled and operate on an automatic work cycle. The scope of operations and variety of parts indicate the versatility and flexibility of this type of Snyder special-purpose machine.

If you are interested in accurate cost-control in any metal-cutting operation, we invite your inquiries. *Snyder Tool & Engineering Company, 3400 E. Lafayette Avenue, Detroit 7, Michigan.*

20 Years of Successful Cooperation with Leading American Industries

SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST



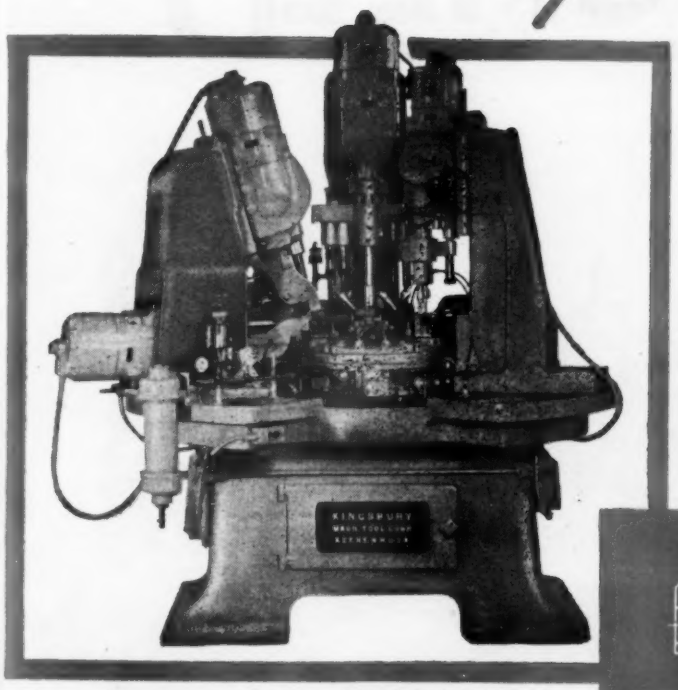
D. (No. 51113)

A. (42595)

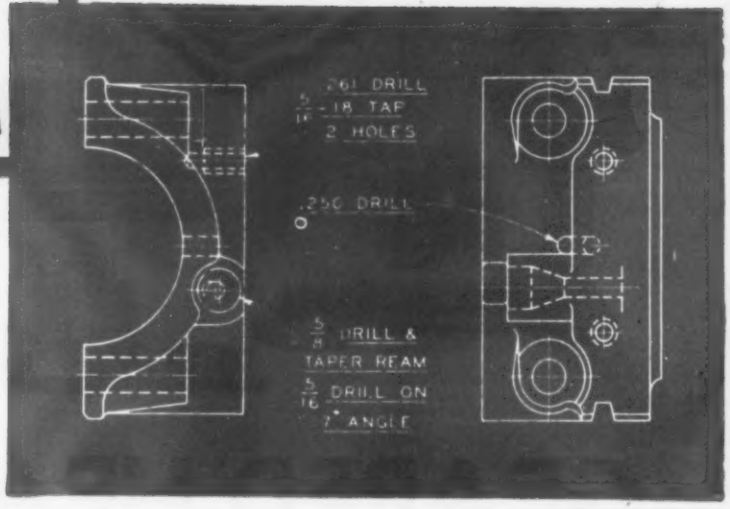
B. (47826)

C. (43218)

FLEXIMATIC
by KINGSBURY



Three operations from three different directions handled in a single chucking of the work . . . . . .



The advantage of the KINGSBURY FLEXIMATIC method for performing various machining operations in a single chucking of the work is exemplified here. The parts involved are automobile rear main bearing caps which are drilled, reamed and tapped on a Model GD FLEXIMATIC from three different directions without rechucking. All operations occur simultaneously during unloading and loading.

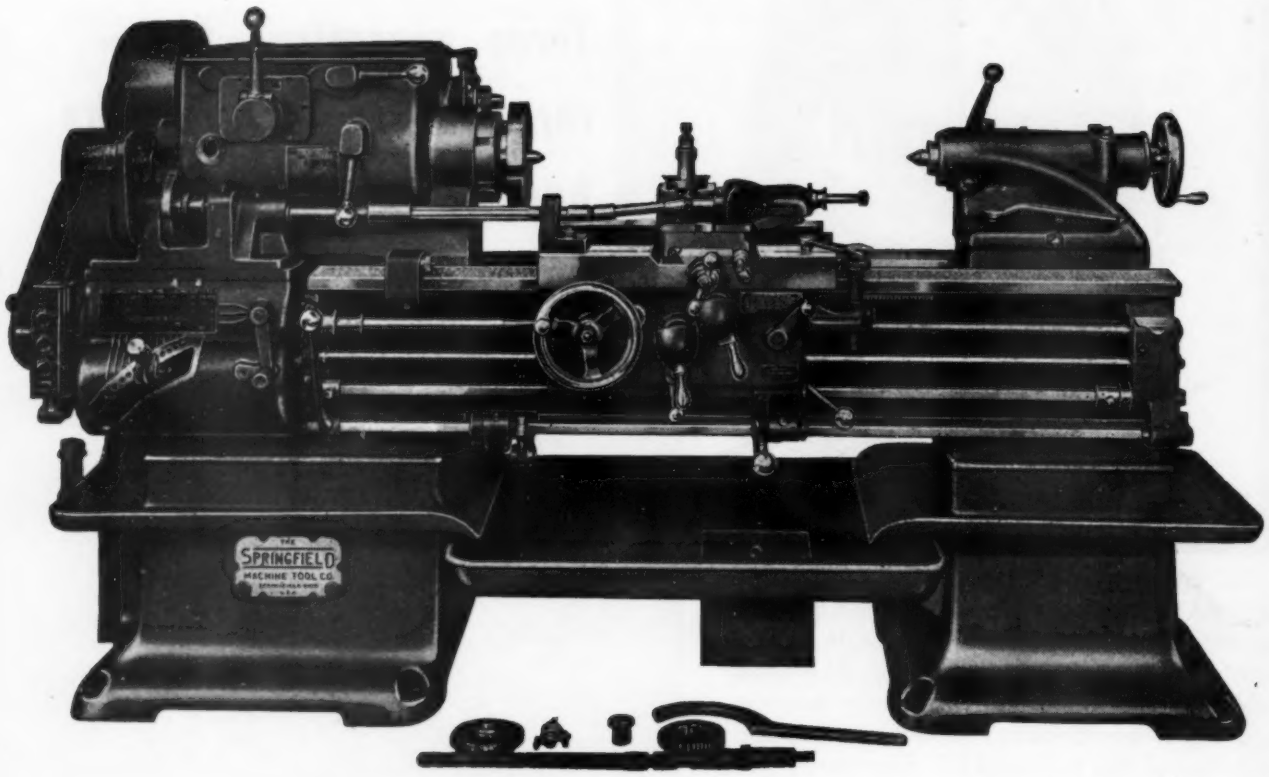
Obviously, ability to handle work of this nature in the way it is handled on a FLEXIMATIC means outstanding production capacity. To this advantage must be added the precision which characterizes FLEXIMATIC performance—a combination which is of such outstanding value in post-war work because it makes every minute count in high speed precision production. Furthermore, KINGSBURY FLEXIMATICS conserve man power through the ability of one operator to easily out-step the productivity of several men on general purpose machines.

Basically the FLEXIMATIC is an automatic indexing machine built up of a number of standard specific operation units in such a way that *all* operations can be performed in a single chucking of the work. By the Kingsbury-pioneered FLEXIMATIC method, unique, flexible and versatile machines are available not only for fast, accurate production but also for quick set-up and convenient change-over.

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A

Choose SPRINGFIELD



GEARED HEAD LATHES

From the ground up, a SPRINGFIELD Lathe represents superior construction and design. All heavy castings, including the bed, are cast in our own foundry . . . gearing is designed for maximum efficiency . . . attachments demonstrate unusual engineering ingenuity . . . lubricating systems and power transmission are built to take it, 24 hours a day. In fact, to fully understand what SPRINGFIELD can do for you, check their superior metal turning records in other shops . . . and judge for yourself.

Under current emergency conditions make it SPRINGFIELD Geared Head Lathe . . . they'll do your job better, now and later, too! Sizes range from 14" to 30". Write concerning deliveries, prices, etc.

The SPRINGFIELD MACHINE TOOL *Co.*

SPRINGFIELD OHIO U.S.A.

THE MODERN WAY TO Reduce Forging Costs!

THE *Powerful Squeeze* OF THE H-P-M FASTRAVERSE PRESS HAS PROVIDED INDUSTRY WITH ITS MOST DIVERSIFIED FORGING MACHINE

Speed, flexibility, versatility and a high degree of control make the H-P-M "All-Hydraulic" press the ideal machine for diversified forging work. In a great majority of cases, the H-P-M FASTRAVERSE forging press can do the work of three different machines, viz: hammer, upsetter and mechanical forging press. H-P-M presses also are ideally suited for hot forming and trimming.

When H-P-M forging presses are employed, impact stresses are negligible. A steady squeeze pressure kneads the metal as it flows. The structure, grain flow and strength of H-P-M press forgings compare equally with those produced by impact forging machines. Normally only one stroke of the press is required to perform the forging operation. Due to the fact that speed, pressure and travel are under absolute control, H-P-M press operators need not be skilled workmen.

Investigate these revolutionary H-P-M "All-Hydraulic" forging presses. Write today for Bulletin 4407.

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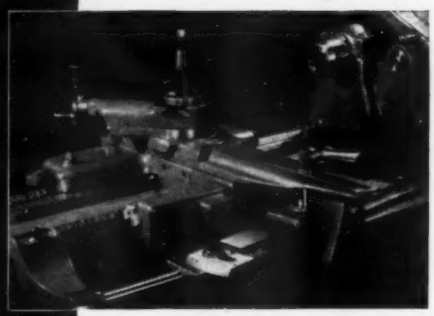
HPM

All-Hydraulic PRESSES
FOR CLOSED DIE and FLAT DIE FORGING

SOUTH BEND LATHES

For Accuracy
Versatility
Dependability



TELESCOPIC TAPER ATTACHMENT
For 10", 13", 14½", and 16"
South Bend Lathes

This and other South Bend Lathe Attachments and Accessories permit quick tooling for a wide variety of precision machine work. Write for free Catalog 77. No obligation.

South Bend Lathes combine three distinguishing features which have won for them the acclaim of discriminating machine tool users everywhere:

» Accuracy that permits working to close tolerances and machining work with such smoothness that often one or more finishing operations can be eliminated.

» Versatility to perform a wide variety of precision operations easily, quickly, and economically that otherwise would require installation of additional equipment.

» Dependability achieved through careful design and rugged construction assures day-in, day-out, trouble-free performance at low cost long after the installation has repaid its original cost.

Write today for Catalog 100-D which illustrates the entire line of South Bend Precision Lathes in full color and gives complete, detailed specifications of each model.

SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • • SOUTH BEND 22, INDIANA

LATHE BUILDERS SINCE 1906

Tell the world about your products on name plates of *Alcoa Aluminum*...

Labeling products is something Alcoa Aluminum has been doing well for many years. These labels are lasting because their base is corrosion-resisting aluminum. And they are intriguing because aluminum takes so many attractive surface finishes.

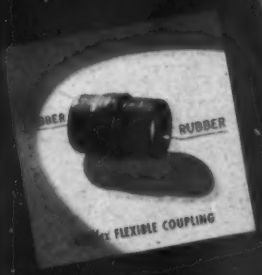
Alcoa will be pleased to put you in touch with companies who help design and make name plates of Alcoa Aluminum.

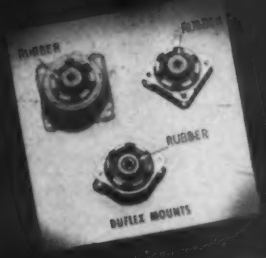
The same techniques which make these name plates interesting are doing the same thing for many manufacturers' products. Alcoa will gladly advise you on methods of producing these finishes on aluminum alloys. Write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA FIRST IN **ALUMINUM**

ALCOA ALUMINUM

Torflex Flexible BEARINGS HARNESS VIBRATION AND NOISE





● Three of the most destructive enemies moving parts have to contend with are vibration, noise and shock. They impair smooth operation, cut down efficiency, produce excess wear and shorten the life of any piece of equipment. *Torflex* Flexible Bearings were created, engineered and designed to control and eliminate vibration, noise and shock and are manufactured by Harris Products Company, pioneers in the field of engineered vibration control.

Torflex Flexible Bearings consist of a tube or ring of rubber stretched longitudinally between two concentric metal sleeves which prevent the rubber from returning to its original state. The pressure thus exerted by the rubber, on the metal sleeve, insures a high capacity mechanical bond between the rubber and metal under all operating conditions. *Torflex* Flexible Bearings are free from wear, also have long life, compensate for parallel and angular shaft misalignment, require no lubrication, and are widely used to transmit torque. They come in a wide range of sizes, are simple and easy to incorporate in designs and to install.

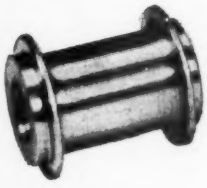
We welcome the opportunity to discuss with engineers and manufacturers the possibilities and the many advantages of *Torflex* Flexible Bearings in the control and elimination of vibration, noise and shock. Drop us a line today.

HARRIS
PRODUCTS COMPANY
CLEVELAND 4, OHIO

How to Cut the *COST* of *PARTS*

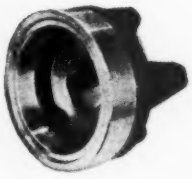
Here are just a few examples of the important cost-cutting jobs done in the production of precision parts by Acme-Gridley 4, 6 and 8-spindle Bar and Chucking Automatics.

If you have parts to produce and want precision work at costs that help you meet your competition, write us about it.



● 2¼" steel hub—15 operations—machine time 28 seconds—Bar Automatic.

● 10½" Cast Iron Motor Bracket—14 Chucker operations—machine time under one minute.



● Differential Housing—18 Chucker operations—cost 70% under previous method.

● Cast Iron Motor Piston—15 tools first operation—14 tools second operation, on Chucker.

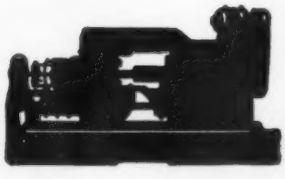
● Cast Iron Distributor Housing——42 operations on 2 Chuckers—costs far below previous record.

● Steel Bearing Race—turned from seamless tubing on bar automatic—machine time cut 90%.

● A 200,000 quantity production job from bar stock—machine time 6 seconds.

● Valve Stem—a high precision stainless steel job for bar automatic—machine time 18 seconds.

ACME-GRIDLEY BAR and CHUCKING AUTOMATICS



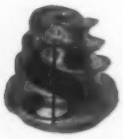
Maintain accuracy at the highest spindle speeds and fastest feeds modern cutting tools can withstand.

THE NATIONAL ACME COMPANY

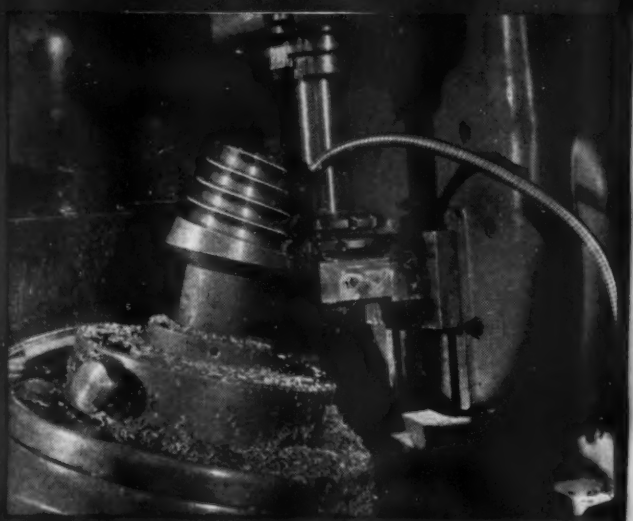
170 EAST 131st STREET • CLEVELAND 8, OHIO

How to make Profits TODAY

AUTOMATIC PROCESSING IS THE ANSWER

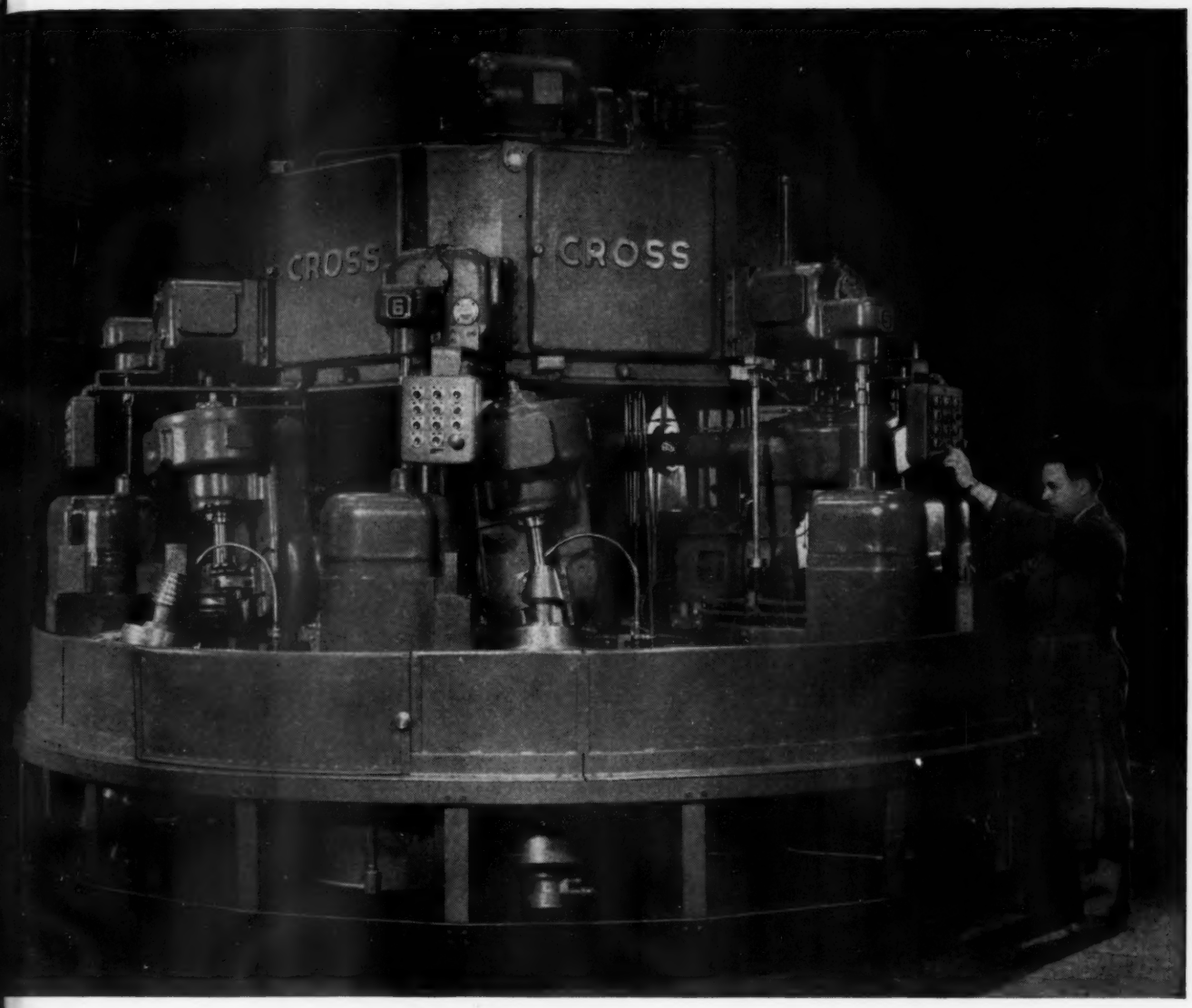


Here's an example: This Cross Special Machine with one unskilled attendant produces the equivalent of 10 individually operated machines of conventional design. It reduces the piece cost of machining Oil Drill Cutters from $.95 to $.50. It returns a first year profit of 117% and 51% on the original investment during each subsequent year of use.



CROSS

New York • Chicago • DETROIT • Cleveland • Cincinnati



Here's how it works: The bed rotates continuously. During one revolution, each of six independent, self-contained stations mills the taper threads on one piece of work—six pieces are completed in a revolution. As each station passes the operator, he simply unloads, reloads, and starts the automatic cycle by pushing a button. Production is 40 Oil Drill Cutters per hour at 80% efficiency.

Send for the booklet that tells about other Cross case histories that increased profits by lowering costs. Write The Cross Company, Detroit 7, Michigan, Dept. 191.

S-27

SPECIAL MACHINES

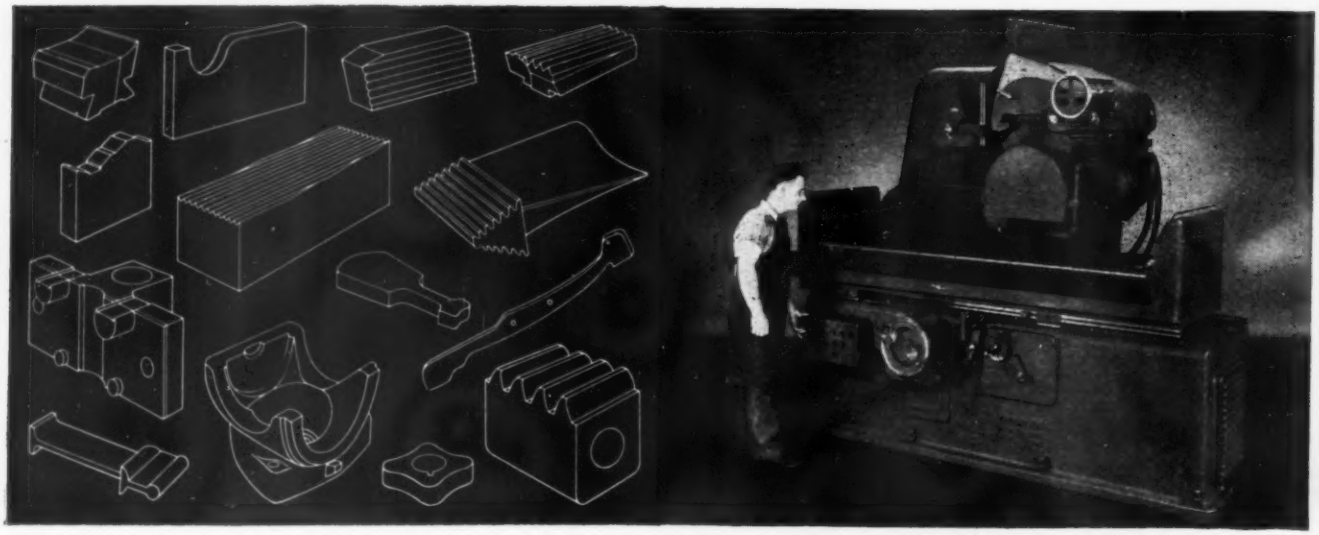
for automatically performing any one or a combination of metal cutting operations
TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

Important Message

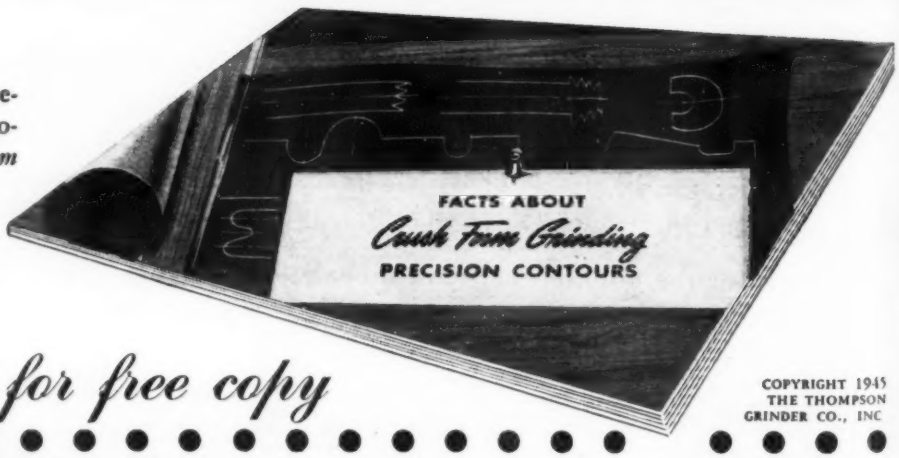
to all interested in production of precision flat form contours

1. Contours like these can be produced more economically and accurately by a proven crush form grinding process known as *Thompson Truforming.* (REGISTERED TRADEMARK)

2. The ONLY machine that is *completely engineered and built* for crush form grinding precision contours is the new *Thompson Truform Grinder.*



3. To meet individual requirements, various types of automatic *Thompson Truform Grinders* are available. For advantages and complete pictorial production explanation send for this new book.



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THE THOMPSON
GRINDER CO., INC

CRUSH FORM CONTOUR GRINDING DEVELOPMENT LABORATORY

The Thompson Grinder Co., Inc., Dept. 13, Springfield, Ohio

Gentlemen: Please send me your new 16 page pictorial book describing Thompson Truforming (Crush Form Grinding on Surface Grinders).

*Name*_____ *Position*_____

*Company*_____ *Address*_____

*City*_____ *Zone*____ *State*_____

...ee grooves form broached on automotive part.

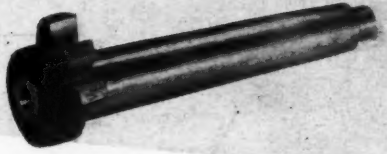
Connecting Rod Cap with joint faces surface broached.

Aircraft Engine Bearing with slots surface broached using indexing fixtures.

Tractor Link surface broached on long surfa...

Throughout the metal working field

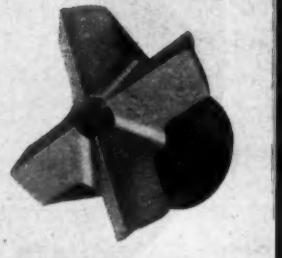
...th broached on domestic washer segment gear.



Gear teeth surface broached on automotive steering part.

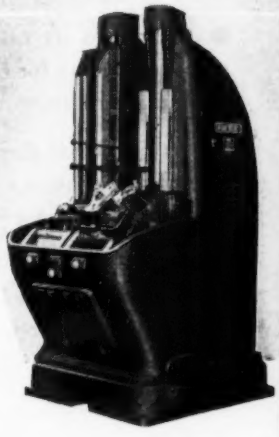
Long surface with grooves surface broach... on Army Half-Track Link.

...h broached on both sides of pliers.



Four angular surfaces broached on rad... drill using indexing fixtures.

...h sides of automotive connecting rod surface broached.



In all types of plants in the metal working field there are many pieces being made that can be produced faster and more accurately thru the use of surface broaching. Lower costs, so necessary under present conditions, are being obtained thru installation of Footburt Surface Broaching Machines where ordinary methods of machining have formerly been used. We will be glad to study your machining problems and make recommendations on Footburt machines where surface broaching seems desirable. Just send blueprints with production requirements.

THE FOOTE-BURT COMPANY • Cleveland 8, Ohio

Detroit Office: General Motors Building

Footburt Patented Tooth Form

FOOTBURT *Surface Broaching*

For low Cost
DRILLING
REAMING
TAPPING

FOSDICK

High Speed
DRILLS

● Showing a six spindle Fosdick High Speed Drill, drilling and reaming shutters for Fairchild cameras. Various diameters can be worked in succession by the different spindles.

This is typical of the versatility of the multiple spindle machines and of the economy of operation resulting from combining several operations on one machine.

Fosdick High Speed Drills are furnished in single and multiple spindles up to six, in capacities up to 1¼ inch diameter. Also with bases to accommodate various spindle combinations on center distances from 12 inches to 36 inches.

For low cost, high speed drilling operations consult Fosdick. Our High Speed Drill bulletin H. S. A. is also available.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

CAN YOU SEE YOUR WIFE IN THIS PICTURE?

BACKS bending over the village stream . . . wooden paddles thudding against wet clothes. It's wash day in southern Europe!

You'd hardly expect to find your wife at a social gathering of this kind at the creek near Main Street! No, she'd rather let a machine handle your shirts and socks. And the machine *does it*—quicker, easier, better.

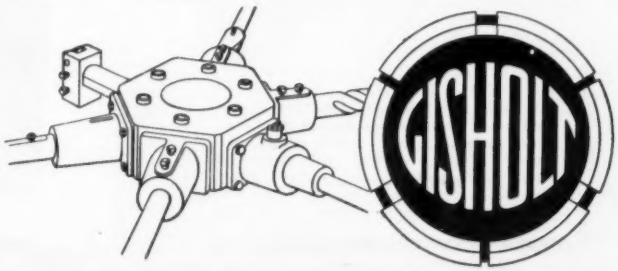
Washing machines weren't invented in this country. They were known in England as long ago as 1782. But, it remained for American manufacturers to produce them in numbers—to *popularize* them. In two short decades before the war, they put electric washing machines in 13,000,000 homes—and reduced the cost by two-thirds!

Other nations have craftsmen; other nations have materials. But it's *your* wife who gets the machine to end this drudgery—at a price you can't resist.

It has been Gisholt's privilege to work with many manufacturers of washing machines—providing the tools to machine many parts, and helping to devise more efficient machining methods. You'll find this true in almost every industry where the swift, accurate turning of metals is important to lower manufacturing costs.

GISHOLT MACHINE COMPANY

1201 East Washington Ave. • *Madison 3, Wis.*



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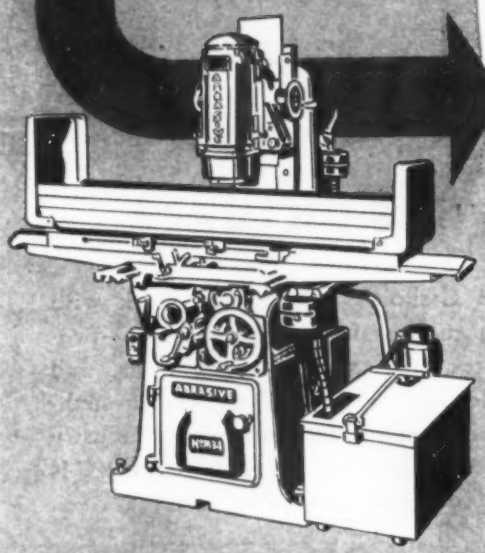
- ✓ RELIABILITY



Fully automatic No. M-34 Vertical Spindle Surface Grinder. Capacity: 24" longitudinal, 8" transverse and 12" vertical.

Write us for information on ABRASIVE Machines on the Government Machine Tool Surplus List . . . just send the machine serial number. Attachments, accessories and repair parts are also available.

ABRASIVE *has them all*

These factors, so essential for precision grinding on a production basis, are inherent in all ABRASIVE Mechanical Feed Grinders. Dependable and positive . . . with full shock absorbing qualities . . . ABRASIVE's Mechanical Feed has been time-tested and production-proved for superior grinding.

Wherever accuracy, smooth finish and high production are essential, you can rely on ABRASIVE Machines. They maintain high standards for precision grinding year after year.

Bulletin on Request

ABRASIVE MACHINE TOOL CO.

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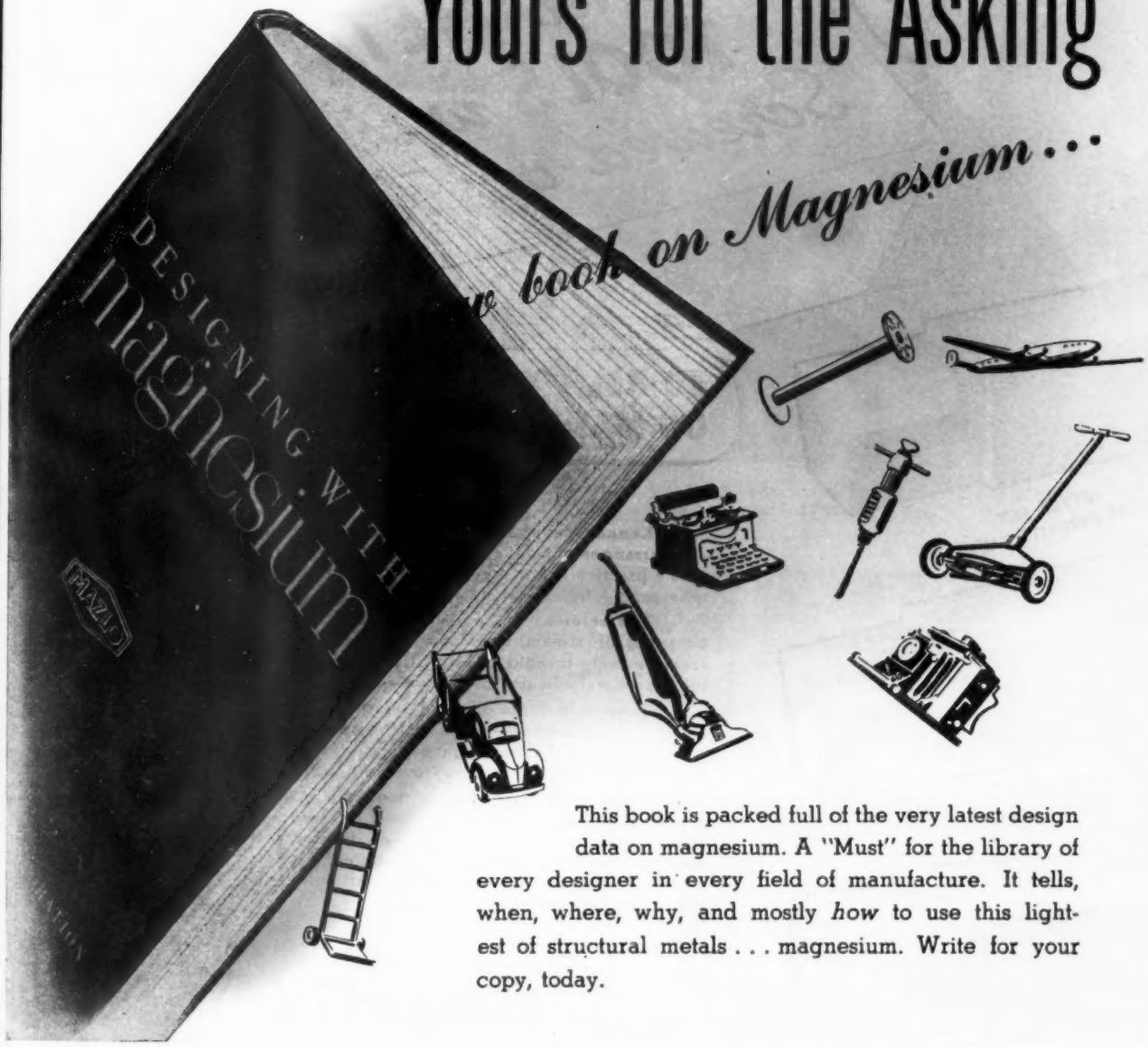
ABRASIVE

ACCURACY BOOSTS PRODUCTION

Yours for the Asking

... book on Magnesium ...



This book is packed full of the very latest design data on magnesium. A "Must" for the library of every designer in every field of manufacture. It tells, when, where, why, and mostly *how* to use this lightest of structural metals . . . magnesium. Write for your copy, today.

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Introducing

KENNAMETAL TOOLS with "Screwed-on" Tips

TO HELP YOU CUT TOOLING COSTS ON MANY MACHINING OPERATIONS

STYLE 6ST
(3ST OPPOSITE HAND)

STYLE 12ST
(11ST OPPOSITE HAND)

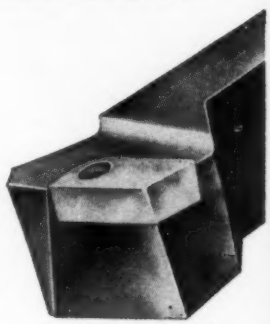
STYLE 40ST
(39ST OPPOSITE HAND)

Kennametal tools having tips attached with recessed-head screws —an arrangement developed and perfected by Kennametal Inc.—provide a practical, new way of obtaining even better performance from inherently efficient Kennametal.

The screwed-on assembly is a positive, simplified mechanical fastening of streamlined design. The screw, angularly positioned, serves merely to hold the tip firmly in the shank (heat-treated) against the recess walls, which of themselves resist the main cutting thrusts.

These new tools offer you many advantages, including: Easier, cheaper attachment, in your shop, of tip to tool; greater tip durability and more consistent performance; opportunity to interchange tips quickly in same shank; minimized stock keeping.

Kennametal "Screwed-on" tools are now available in larger sizes of fifteen different styles. Standard tips are made, of different Kennametal compositions, for cutting steel, cast iron, or non-ferrous metals. Catalog particulars and prices are yours for the asking.

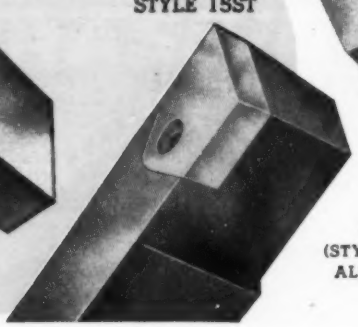


STYLE 21ST

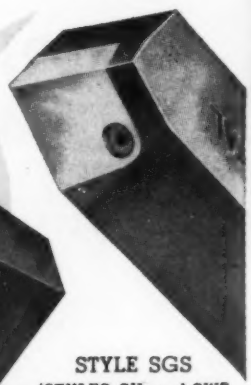
KENNAMETAL
SUPERIOR CEMENTED CARBIDES
KENNAMETAL *Inc.*, LATROBE, PA.

STYLE 2ST
(1ST OPPOSITE HAND)

STYLE 10ST
(9ST OPPOSITE HAND)

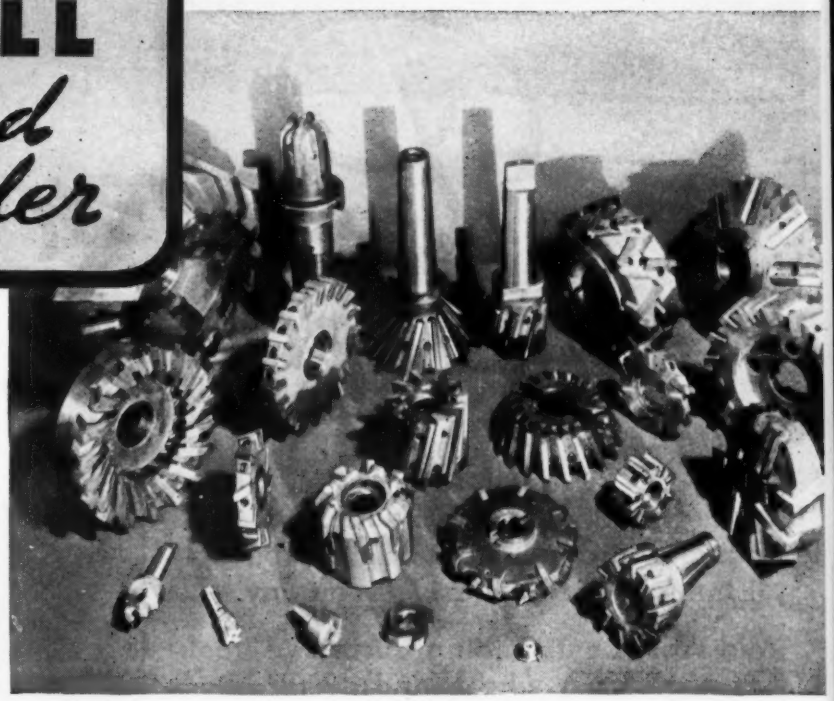


STYLE 15ST



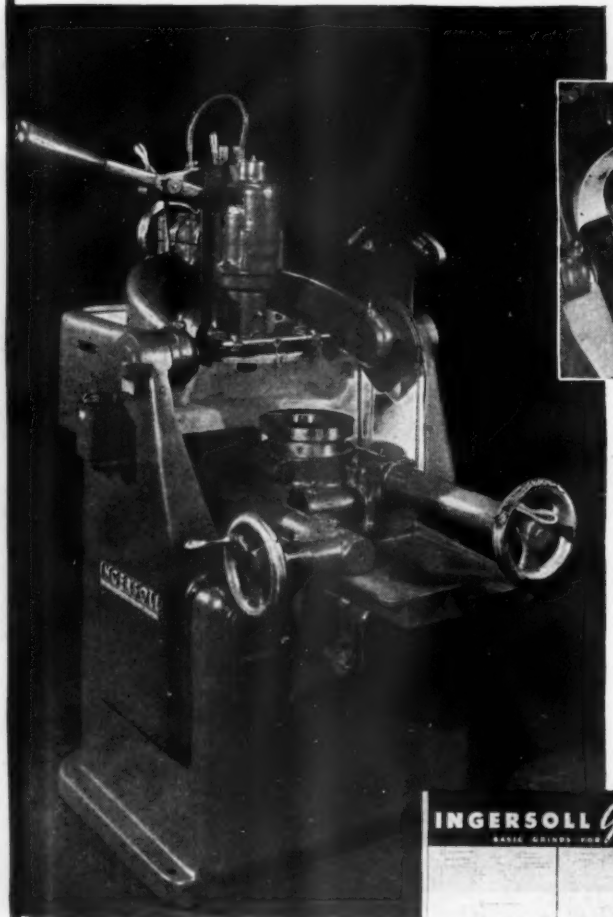
STYLE SGS
(STYLES SJL and SWS ALSO AVAILABLE)

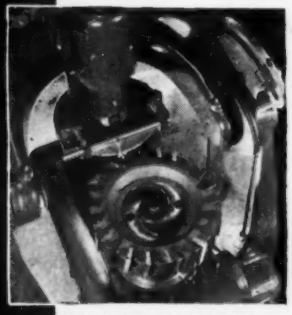
INGERSOLL
Cutters and Cutter Grinder



Ingersoll specializes in the design and manufacture of inserted blade milling and boring tools for use on all makes of milling and boring machines. A wide variety of standard types and designs of face mills, half side mills, staggered tooth slotting, helical slab and end mills cover most milling and boring applications. Modifications of these standard designs and special cutters are made to suit the unusual conditions. Cutters are furnished with high speed steel, cast alloy, or carbide tipped blades.

Write for cutter catalog describing complete line of standard inserted blade cutters.





CONVENTIONAL FACE MILL

INGERSOLL SHEAR CLEAR

DOUBLE ANGULAR CUTTERS

To obtain best results with your milling cutters it is essential that they be properly ground. The Ingersoll cutter grinder is particularly designed for grinding face milling cutters at a single setting from 4″ to 30″ in diameter with maximum peripheral face of 7″. It will also grind solid shank, radius, staggered tooth, and angular inserted blade cutters. It is fast, accurate, and may be operated by the average mechanic.

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Write for cutter grinder bulletin which illustrates the wide range of application of this grinder and assists the operator in the best methods of grinding.

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Proven quality and dependability of performance are hallmarks of the products of the Mid-West Abrasive Company.

Mid-West's outstanding successful tool room grinding wheel, and every other product of the broad Mid-West line—honing stones, sharpening stones, coated abrasives, disks and wheel dressers—all must bear these two hallmarks.

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MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

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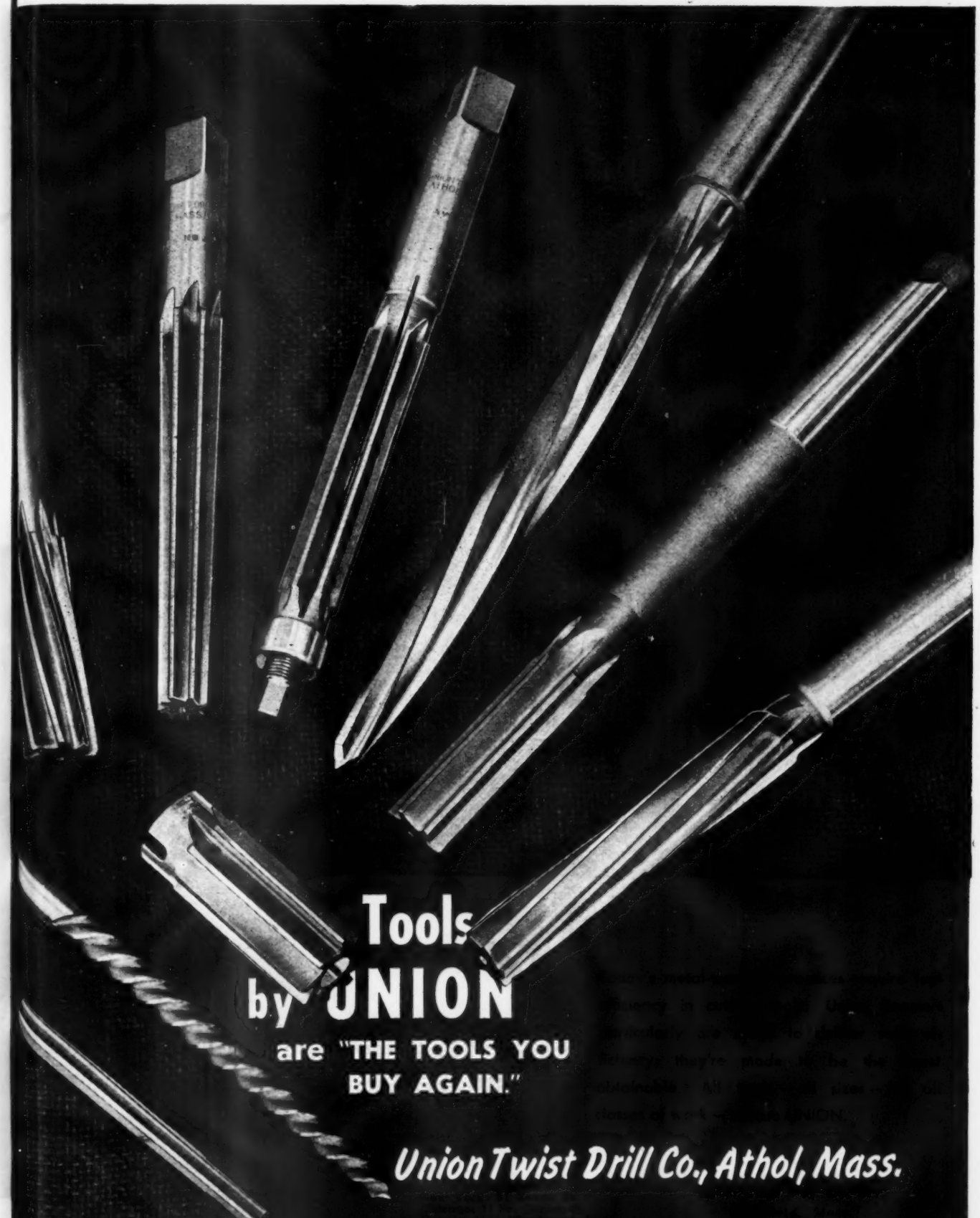
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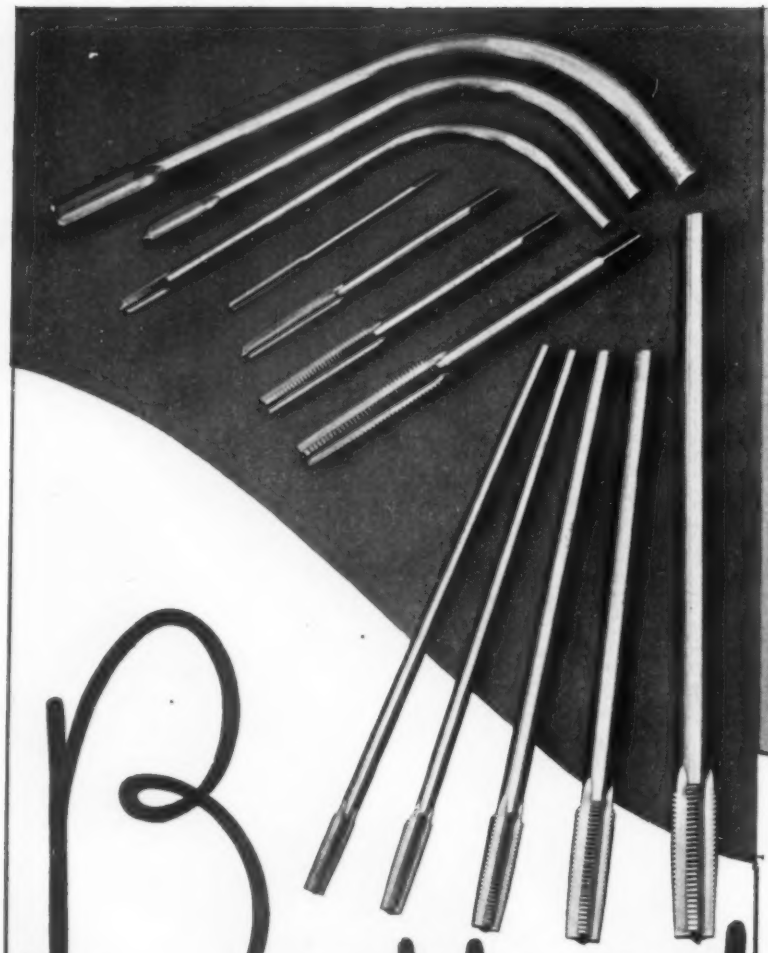
by UNION
are "THE TOOLS YOU
BUY AGAIN."
Union Twist Drill Co., Athol, Mass.
UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Company



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HAND TAPS

Card Spiral Pointed Hand Taps are designed for tapping through holes or blind holes when drilled deeply enough. Correctly used, these Taps produce a smooth, free-cutting action which results in excellent, accurate threads.

FORCING THE CHIPS *ahead* OF THE TAP

Above is a detailed view of chip-action produced by Card Spiral Pointed Hand Taps. Long, curling chips are forced ahead of the Tap, avoiding clogging, increasing strength of Tap, reducing breakage.

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When you specify Presteel stampings they are fully guaranteed by the leading company using controlled press operations. Why not let Presteel handle *your* stamping problems?

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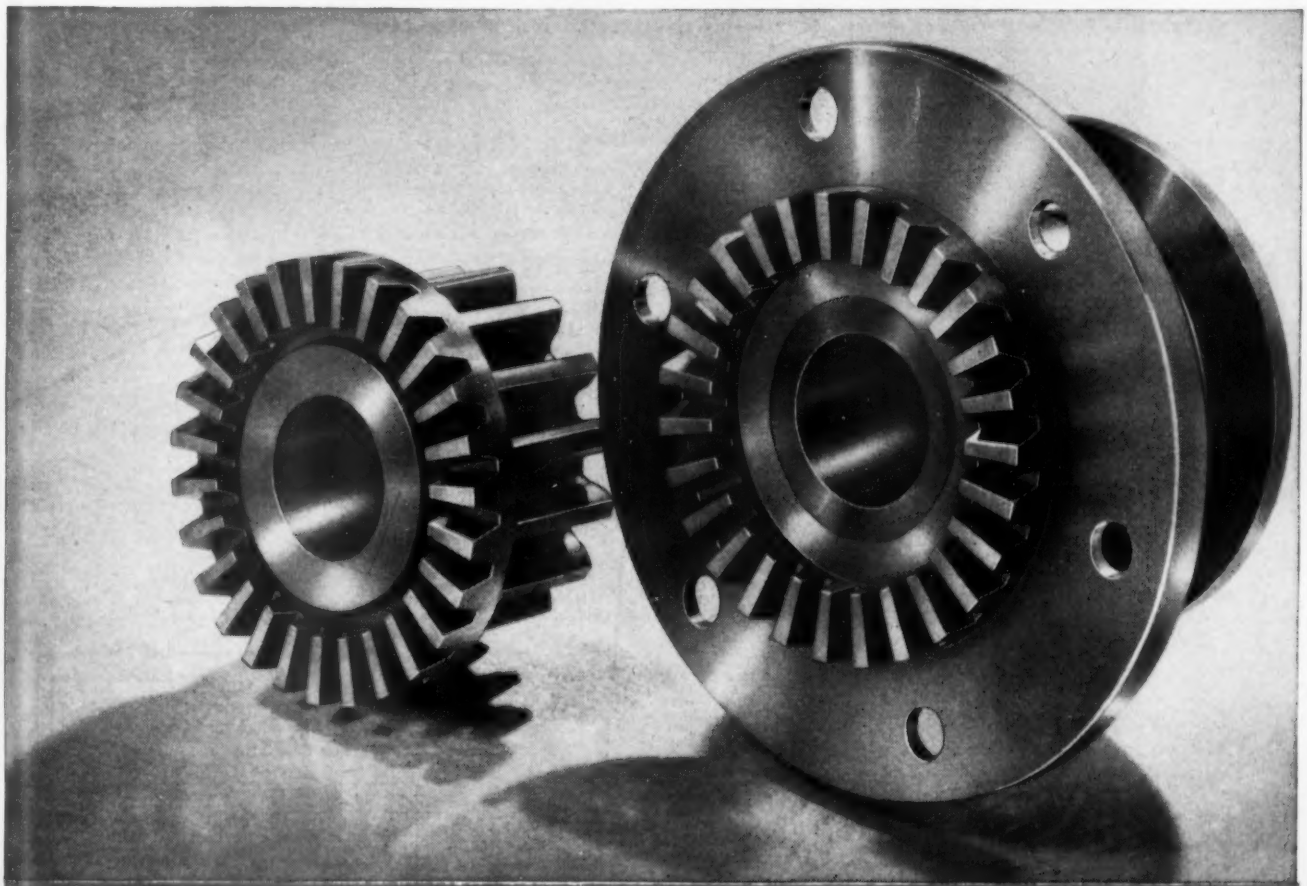
Gears are no better than the skill of the organization which produces them. No branch of the component part field is so dependent upon craftsmen. Wise buyers of gears know this fact and buy not a gear but the product of an organization which they know to be qualified to produce superior work. That's the reason why *G-S* is the world's largest exclusive manufacturer of small gears. This experience is not merely a statistic but is tangibly expressed in the ability of our organization to put the utmost quality in every job. *G-S* Small Gears offer economy, longer life, trouble-free operation, smooth performance, unfailing dependability. Let us discuss *your* Small Gear problems with you, *now!*



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GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

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WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

THIS STORY OF THE NORDEN BOMBSIGHT POINTS THE WAY TO

IMPROVED PRODUCTS

AND

LOWER COSTS

WITH

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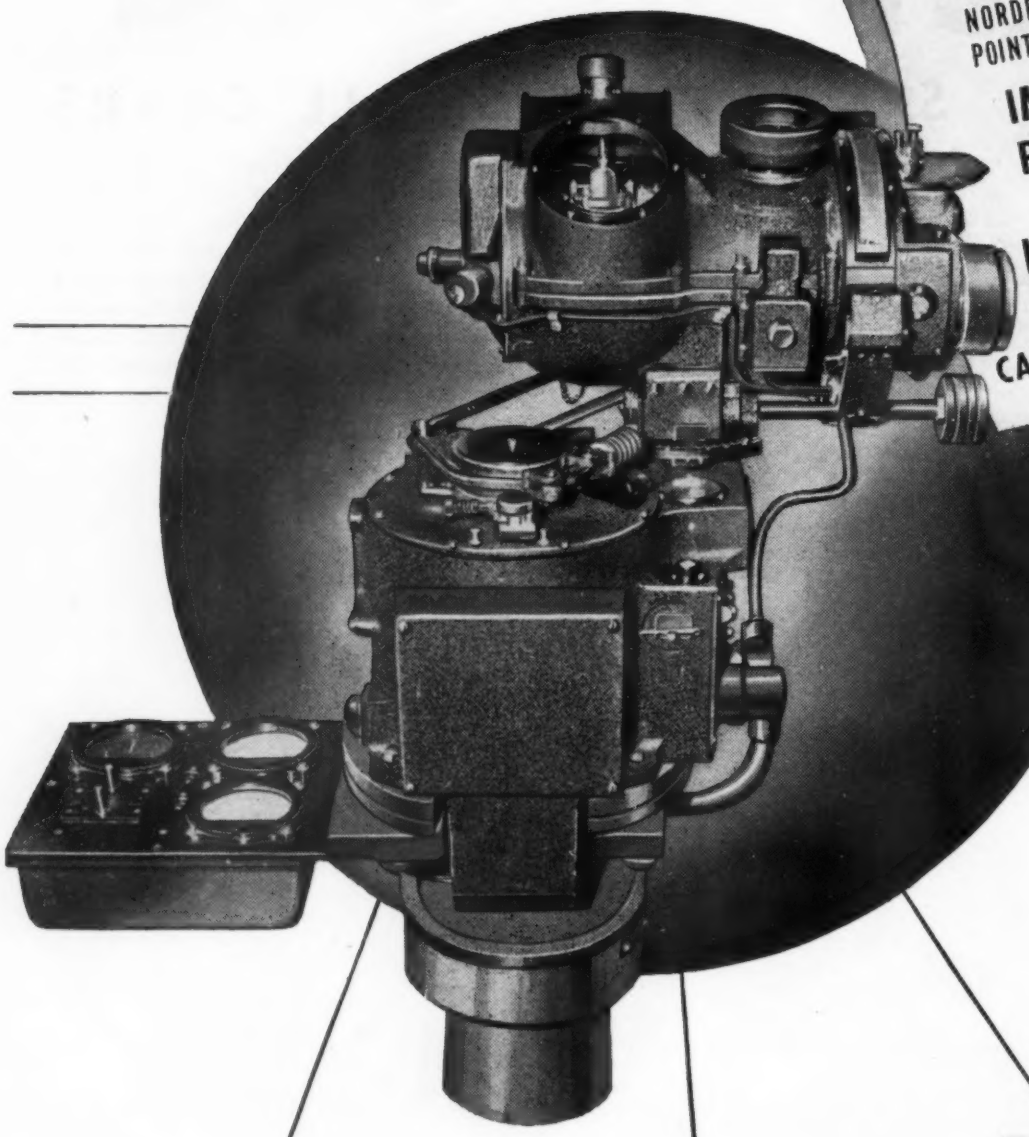

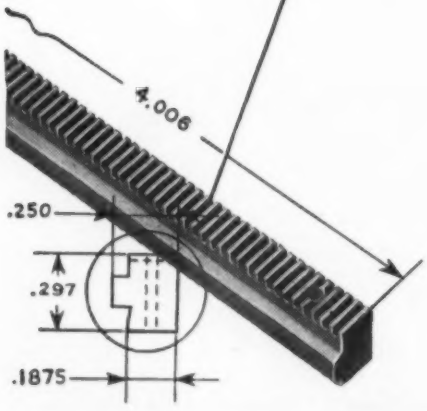

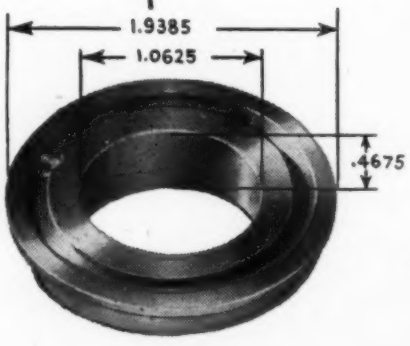

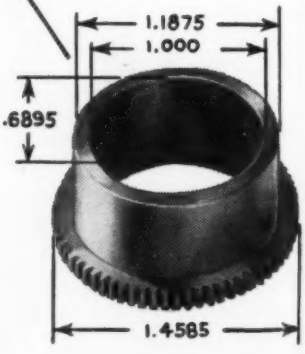

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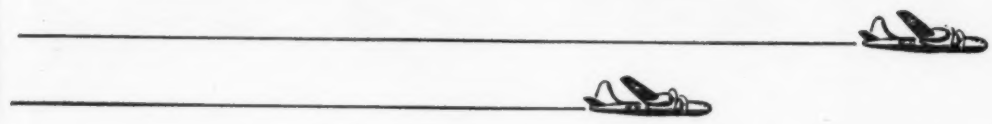
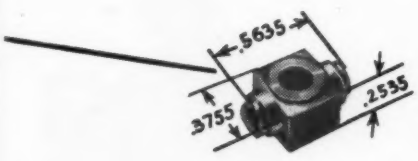
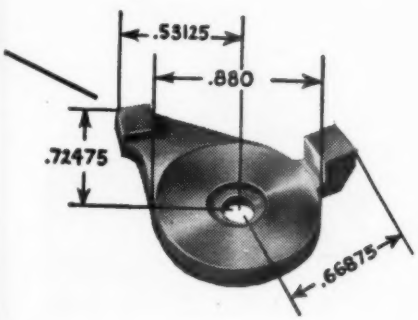
THE CARPENTER STEEL COMPANY, 109 W. Bern Street, Reading, Pa.

To Get *High Precision* Parts with *Fewer Rejects*



. . . use the Stainless that met exacting Norden bombsight requirements





● If ever a job called for close tolerances, plus product dependability, it was this famous bombsight.

The requirements were tough. For instance, one small piece —the heart and nerve center of the bombsight—was held to a tolerance of ±.0001". The part contained less than 1¢ worth of steel, yet was listed as an $8 cost item. Stainless was a "must" for this and many other vital parts, because corrosion resistance, wear resistance and a high strength/weight ratio were necessary.

Why Carpenter Free-Machining Stainless was first choice for these bombsight parts is a story that can now be told.

You can sum it up in one word—"dependability". Said one of the factory superintendents: "Experience with material obtained from other sources has convinced me that we have *less rejections, better machining time, less trouble* in straightening, and *better tool life* with Carpenter Stainless No. 5 bar stock."

Your own precision requirements may be less severe, but you will benefit by the consistent, money-saving uniformity of Carpenter Free-Machining Stainless. Made to tool steel standards in a tool steel mill, Carpenter Stainless guarantees top-flight performance.

Try Carpenter Free-Machining Stainless Steels and see what a difference they make in your production set-up. Your nearby Carpenter representative will gladly help you in solving your Stainless problems. Call him or write us at the mill.

Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis New York, Philadelphia, Providence, St. Louis

ARMSTRONG

ARMSTRONG HIGH SPEED ARMALOY ARMIDE

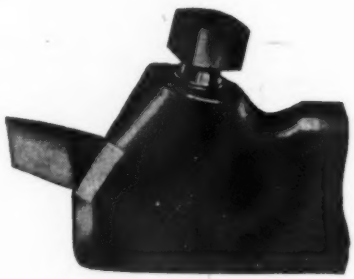
Correct ARMSTRONG TOOL HOLDERS and correct Cutter Bits for every machining speed and every machinable material

The Armstrong System of Tool Holders provides correctly designed ARMSTRONG TOOL HOLDERS for every operation of lathes, planers, slotters and shapers and for many turret lathes and screw machine operations. It also provides proper types of cutters, bits and blades for every cutting-speed and material.

- For general tool room and machine shop use ARMSTRONG HIGH SPEED Bits and Blades are unsurpassed. They will stand up to speeds and feeds far greater than those generally accepted as "standard".

- ARMALOY Bits and their corresponding ARMSTRONG CA TOOL HOLDERS are recommended for machining sand-filled castings, malleable iron, non-ferrous metals, rubber, plastics and for machining steel on modern high production machines, where sufficient speed and feed can be obtained to take advantage of their greater cutting capacity.

- ARMIDE Carbide Tipped Cutters and ARMSTRONG Carbide Tool Holders, make the use of Carbide-tipped tools practical in even the smallest shop. Coming in two grades ARMIDE Red (for steel) and ARMIDE Gray (for cast iron, brass, aluminum and non-ferrous materials). They easily machine hard and tough steels, and stand up to the highest speeds and heaviest feeds, and increase the interval between tool re-grindings as much as 10 to 50 times.



ARMSTRONG TOOL HOLDERS for HIGH SPEED CUTTERS

ARMSTRONG CA TOOL HOLDER for ARMALOY CUTTERS

ARMSTRONG *Carbide* TOOL HOLDERS for ARMIDE CUTTERS

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"

315 N. FRANCISCO AVENUE **CHICAGO 12, U. S. A.**

Eastern Whse. & Sales: 199 Lafayette St., New York 12, N. Y.
Pacific Coast Whse. & Sales Office: 1275 Mission St., San Francisco 3, Calif.

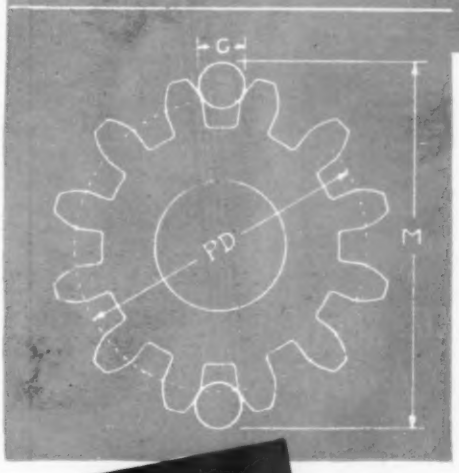
ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms

Van Keuren

simplified GEAR MEASURING SYSTEM

Set No. 26 Ex. Gear Measuring Wires

...provides GREATER ACCURACY... and SIMPLIFIED CALCULATIONS



Simple! . . . The only calculation required is one of simple division.

Reliable! . . . The system is based on formulas approved by the American Gear Manufacturers Association.

Accurate! . . . Van Keuren Gear Measuring Wires are accurate to within 25 millionths of an inch for roundness and exact size.

Van Keuren gear measuring tables give the measurements (M) over the wires (G) for 1 diametral pitch gears of correct pitch diameter (PD). The only calculation required is to divide the measurement for 1 diametral pitch by the diametral pitch of the gear being measured. The tables are complete for gears from 5 to 171 teeth and for pressure angles of 14½°, 17½°, 20°, 25° and 30°. The tables provide for measuring external, internal and helical gears. They are far more accurate than anything previously available and no interpolations are required.

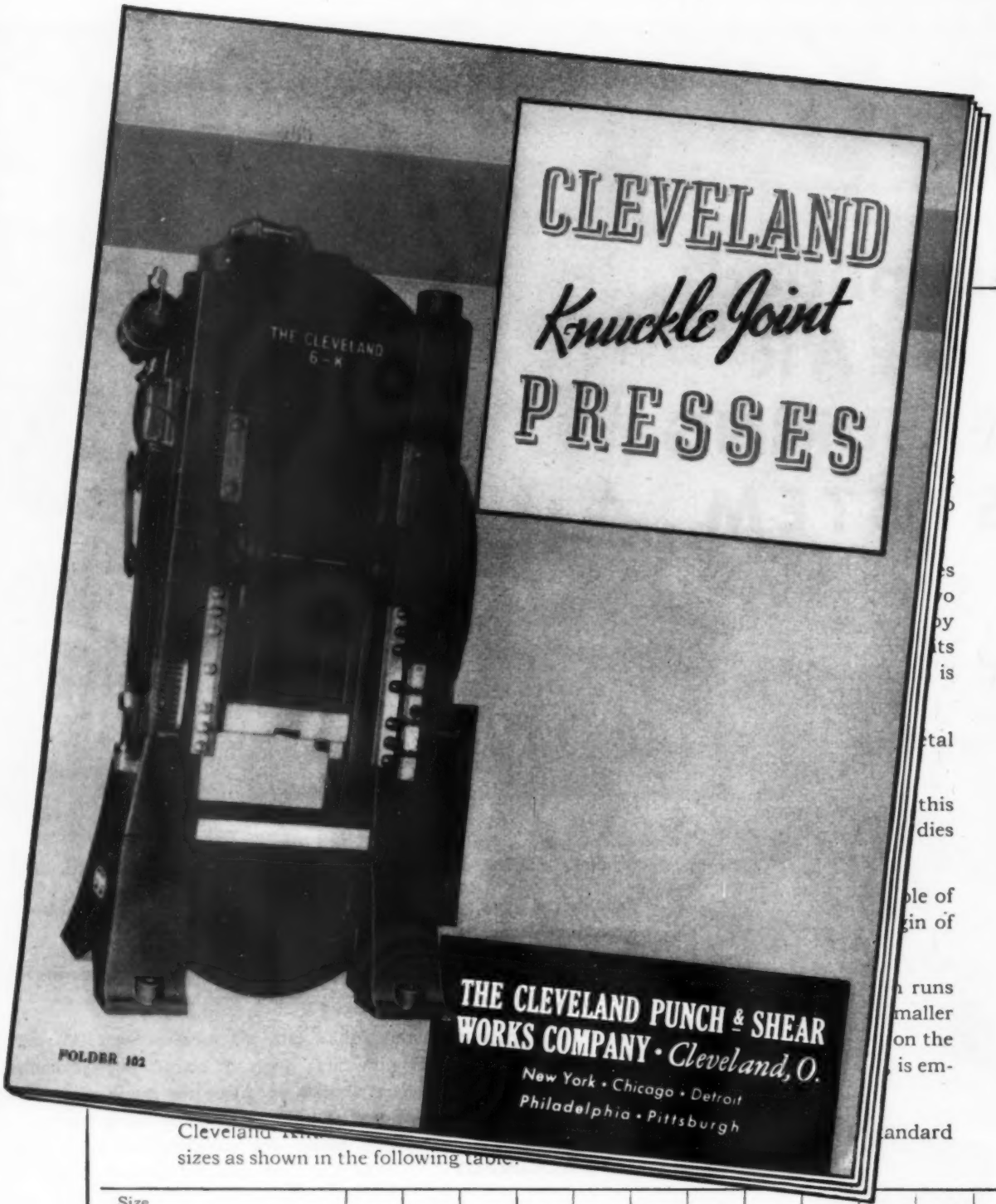
ULTIMATE ACCURACY

Our Catalog No. 33 is a manual of precision measuring systems, giving complete tables and simplified formulas for measuring all standard threads, splines, gears, and worms. Send for this valuable handbook.

THE Van Keuren CO., 176 WALTHAM ST., WATERTOWN, MASS.

25th YEAR

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles.



Cleveland Knuckle Joint Presses are made in standard sizes as shown in the following table:

Size of Press	½ K	¾ K	1 K	1½ K	2½ K	4 K	6 K	8 K	10 K	12 K	15 K	20 K
Capacity in Tons	50	75	100	150	250	400	600	800	1000	1200	1500	2000
Standard Stroke of Slide	1½"	1½"	1½"	1½"	2"	2½"	2½"	2½"	2½"	2½"	3"	3"
Adjustment of Slide	½"	½"	½"	½"	½"	½"	½"	½"	½"	½"	½"	½"
Shut Height	10"	11"	12"	12"	13"	14"	15"	16"	18"	20"	22"	24"
Width Between Uprights—Std.	15"	15"	16"	17"	20"	25"	29"	32"	34"	36"	42"	44"

To meet special requirements it is sometimes necessary to modify the standard stroke, die space, width between uprights or other standard specifications in which case our Engineering Department will gladly cooperate in recommending the most suitable arrangement.

Keep that pencil sharp with ***FIRTHITE***

Here's Why!

During the war it was a matter of *production speed* . . . and carbide cutting tools were the answer.

Today it's a matter also of keeping operating costs down. High production, yes . . . but at costs that meet or beat competition. Again Firthite sintered carbide tools will help you keep red ink out of your records, while turning out a better, more salable product.

if you have a tool or die problem

Call **Firth-Sterling**

STEEL COMPANY

McKEESPORT, PA. • NEW YORK • HARTFORD • PHILADELPHIA • PITTSBURGH • CLEVELAND • DAYTON • DETROIT • CHICAGO • LOS ANGELES

NOW CRUCIBLE STEEL WAREHOUSES DELIVER

—*any size, any length "from stock"*

With their modern high speed MARVEL Hack Saws the Crucible Steel Company's Warehouses can deliver orders "from stock," whether for a few miscellaneous lengths, a thousand alloy steel gear blanks, a single tool steel disc 18 inches in diameter, or other lengths or slices accurately cut-off from any type bar stock.

In their Indianapolis quick service Warehouse shown above they have two No. 9A MARVEL Automatic Bar Feed Sawing Machines (capacity 10" x 10") and one No. 18 MARVEL Universal Roll Stroke Hydraulic Saw (capacity 18" x 18"). The high speed 9A will cut-off identical pieces from single or nested bars automatically with no more operator attention than an automatic screw machine requires. They can be stopped at any point in a quantity run; a miscellaneous cut made; and the quantity run resumed by simply disengaging and reengaging the automatic feed. The No. 18 "Roll Stroke" Hydraulic Saw handles the heavy stuff—will quickly cut-off the largest and toughest bars.

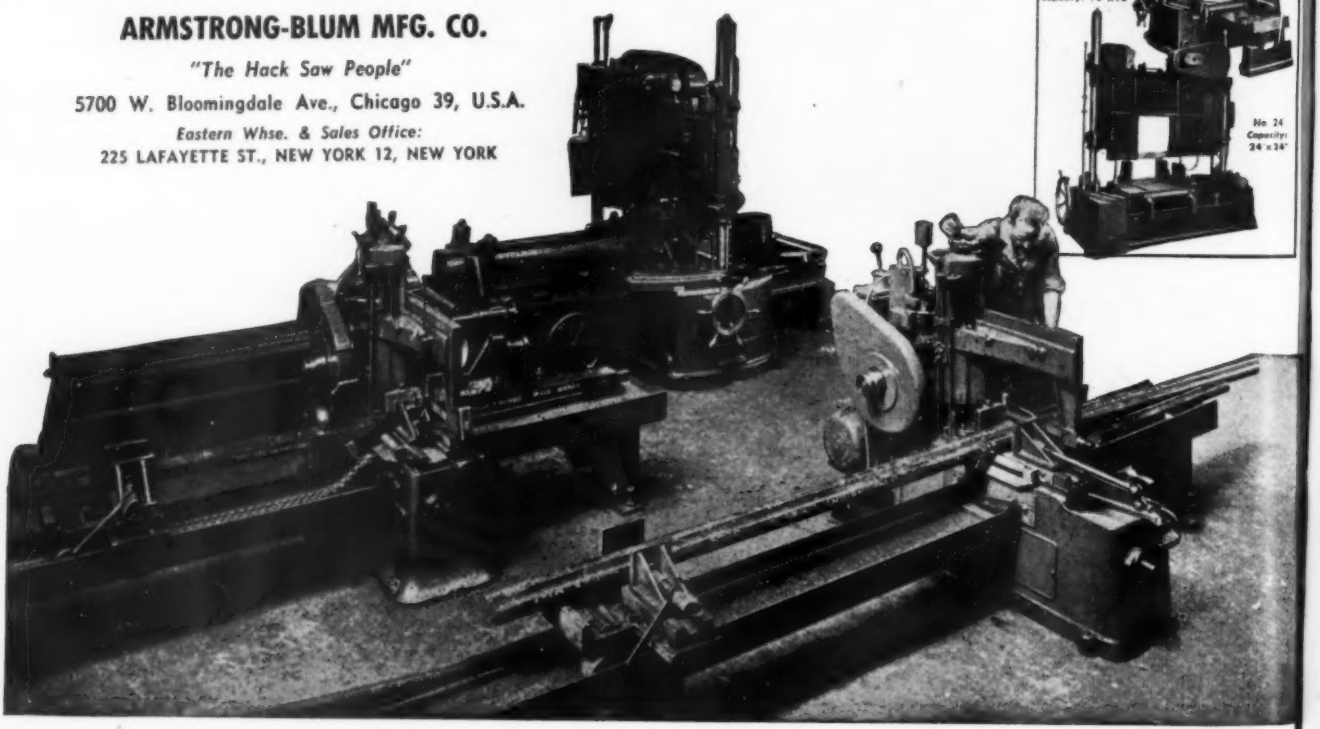
The Crucible Steel Company, like many others, have found the MARVEL Hack Saw method fast, accurate and economical; and that it requires no special skill on the part of the operator. For quick reference see our section in Sweet's File—Mechanical Industries or write for catalog.

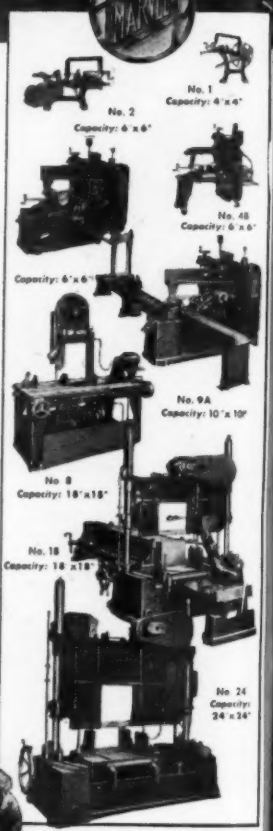
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave., Chicago 39, U.S.A.

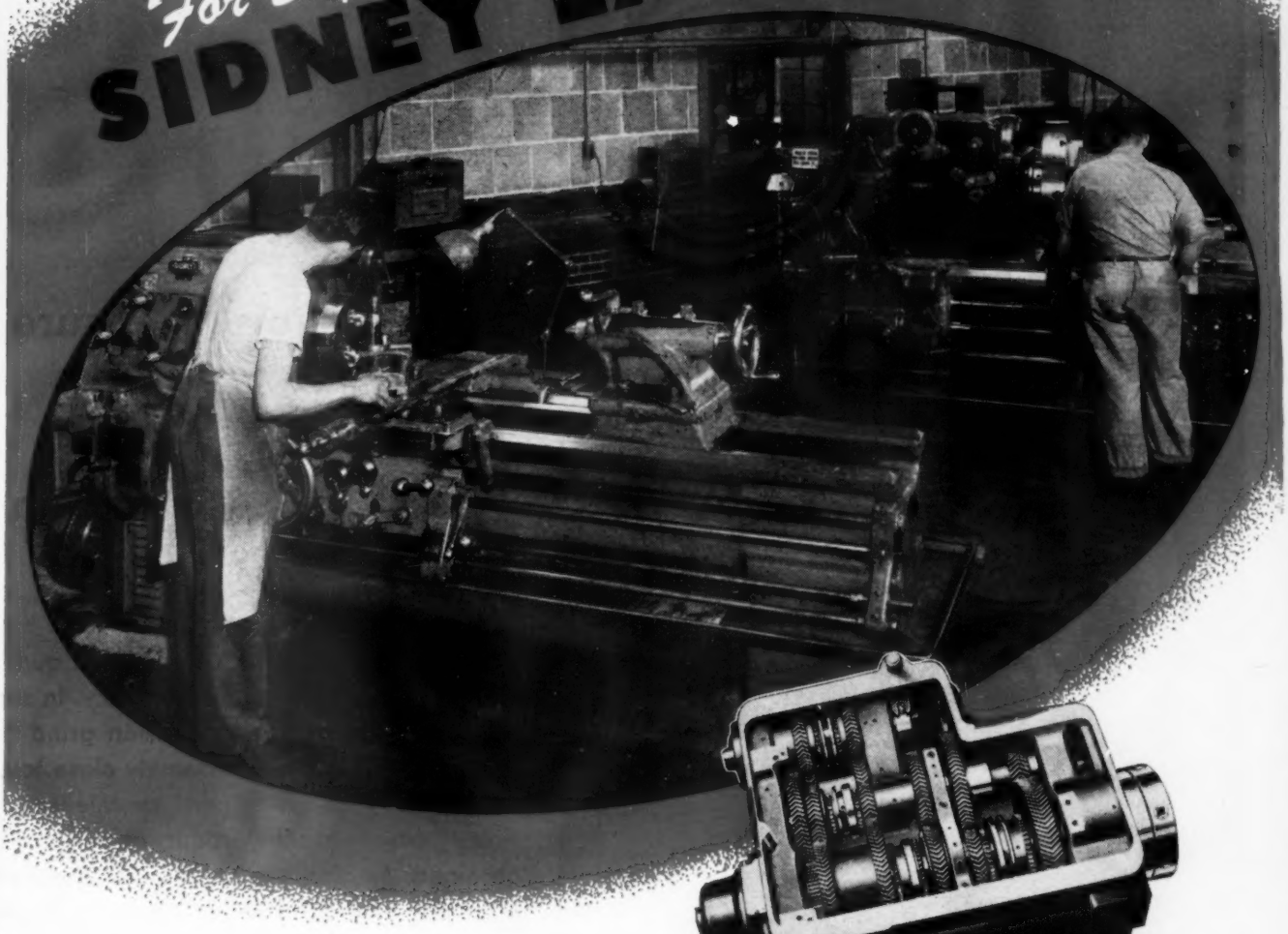
Eastern Whse. & Sales Office:
225 LAFAYETTE ST., NEW YORK 12, NEW YORK

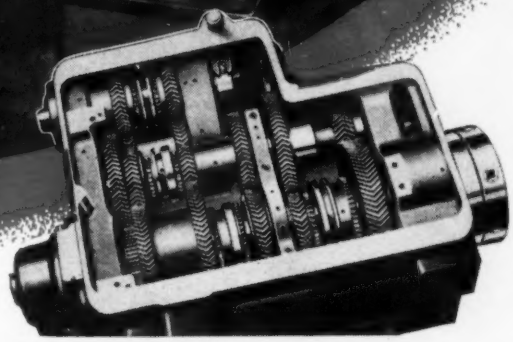




For Dependable Ordnance

SIDNEY LATHES





In meeting the varied and exacting needs of ordnance work Sidney Lathes are doing a really fine job.

The accompanying illustration shows a 20 inch and a 30 inch Sidney Lathe in a midwest ordnance plant.

Here again the Sidney four wall bed construction with cross girts at twelve inch intervals assures rigidity and freedom from vibration. The continuous tooth herringbone geared head furnishes a smooth flow of power ideally suited to the use of carboloy tipped tools often required for the high production of ordnance work.

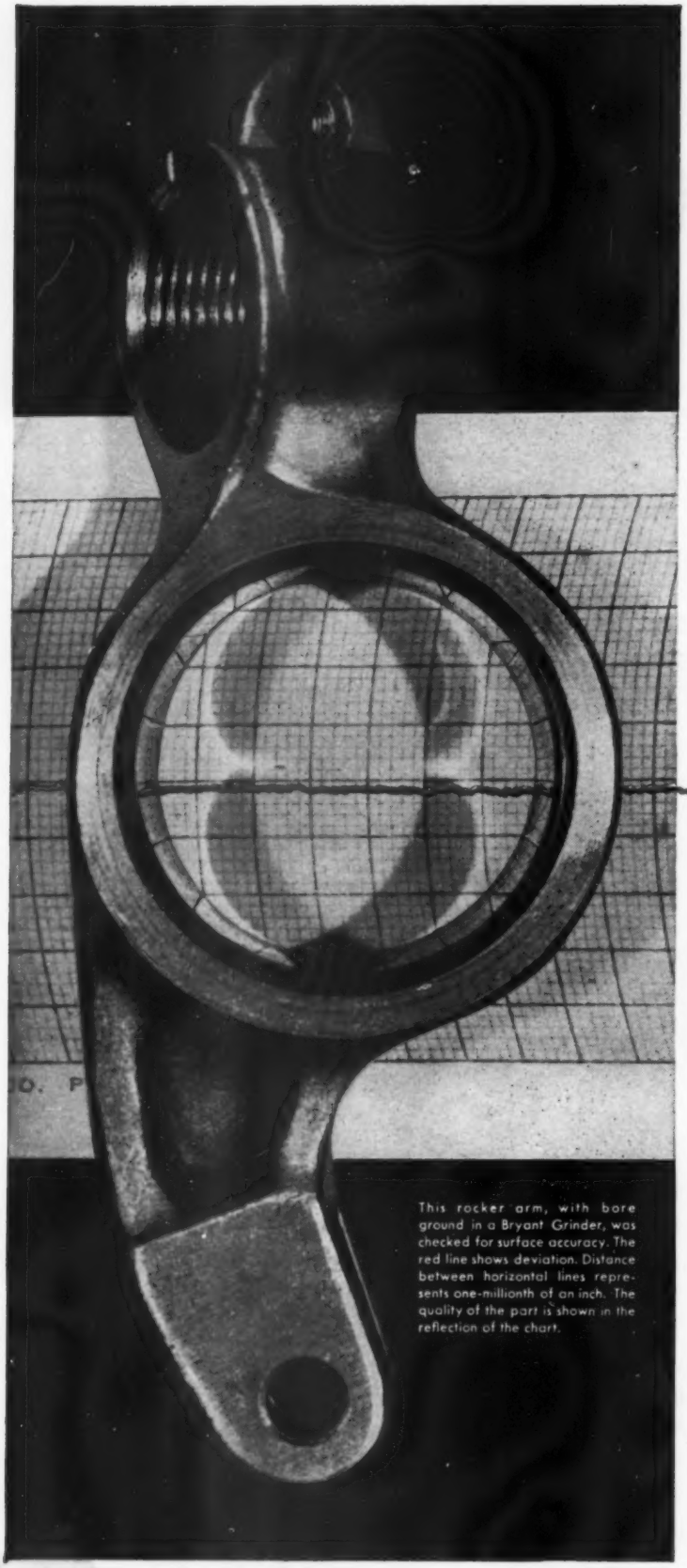
Sidney 16 Speed Herringbone Geared Lathes are available in a range of sizes from 14 inch to 36 inch. Sixteen speeds and forty-eight changes of threads and feeds assure the operator of maximum possibilities with all types of cutting tools. Centralization of controls provides ease of operation from normal working position.

Bulletins on all sizes available.

CONTINUOUS TOOTH HERRINGBONE GEARED HEAD

This type of head perfected by Sidney has gained universal acceptance. This type of gearing provides more tooth contact, resulting in greater strength, smoother action with end thrust eliminated thru the opposed helix angle.

The
SIDNEY
MACHINE TOOL COMPANY
Builders of Precision Machinery
SIDNEY • OHIO
ESTABLISHED 1904



This rocker arm, with bore ground in a Bryant Grinder, was checked for surface accuracy. The red line shows deviation. Distance between horizontal lines represents one-millionth of an inch. The quality of the part is shown in the reflection of the chart.

When you measure *Life* in millionths of an inch

Often times life depends directly on quality of finish and dimensional accuracy. In such cases, it is necessary to precision grind the bore while holding to extremely close tolerances for roundness and parallelism. In every case, rapid production must be obtained. Finding the solution to hundreds of problems like the above has given Bryant a background of engineering know-how, plus a complete line of machines to meet any problems in the internal grinding field.

WE KNOW YOUR PROBLEM IS DIFFERENT

You may never have a problem just like the one illustrated. But the next time you have ANY problem in which extreme accuracy of internal grinding must be coupled with speed of production and the maintenance of close tolerances on other specifications:

Send for the Man from Bryant!

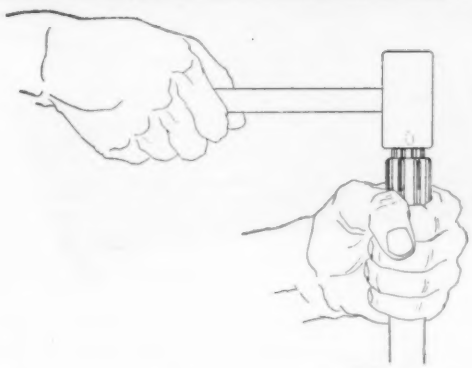
BRYANT

CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

Staples exclusive Expansion Reamers offer an *extra* plus that improves your quality and cuts operation time. It's diamond lapping . . . for the finer finish that means closer tolerances . . . quicker.

Closer TOLERANCES

AGAIN and AGAIN and AGAIN . . . WITHOUT REGRINDING



TO EXPAND . . .
JUST DRIVE IN
THE TAPERED PLUG

Use these better tools — the only ones with Carboloy tips that expand again and again and again without regrinding. Use them — to reduce your tool costs, obtain longer tool life and better hole finish.

Staples Tool & Engineering Co.
Cincinnati 25, Ohio

Staples CARBOLOY-TIPPED CIRCULAR CUTTING TOOLS

REAMERS • CORE DRILLS • SPOT FACERS • COUNTERBORES • END MILLS • SHELL END MILLS • ALSO A COMPLETE LINE OF CIRCULAR SPECIAL TOOLS

JAM-PROOF!

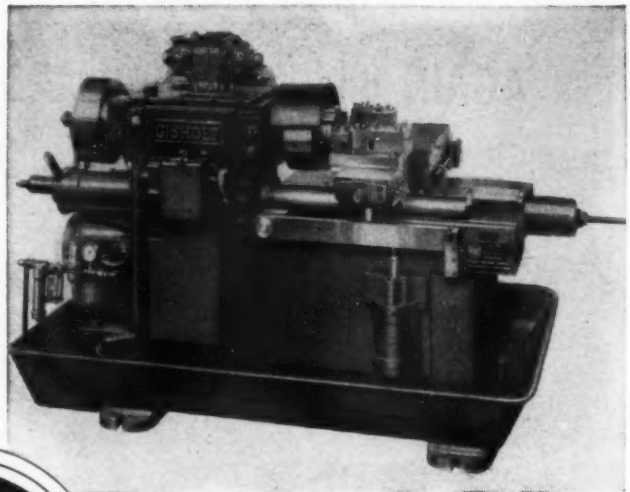
The Gisholt Hydraulic Automatic Lathe

We deliberately put this piece "in the works" of this machine to see if we could make it jam. But it was just a gag. Frankly, we *knew* it wouldn't!

But this illustrates one of the interesting features of the Gisholt Hydraulic Automatic Lathe. It positively refuses to operate if *anything* goes wrong. Immediately, it trips into return traverse and backs out of trouble. The spindle stops No damage can occur.

This simple, foolproof operation of the Gisholt Hydraulic Automatic Lathe will save you time and trouble in many ways—for many years to come. With moving parts reduced to a minimum and running in their own oil, wear and maintenance are almost negligible.

These are only plus values. The primary value of this modern automatic lathe lies in its high productivity—its ability to duplicate performance accurately on all parts—faster, at lower cost. Ask for all the facts about it.



THE GISHOLT HYDRAULIC AUTOMATIC LATHE is a rugged 12-inch lathe for chucking, between-centers or fixture-held work. Completely hydraulic in operation, independent feeds for front and rear slides permit easier tool set-up, making it ideal for handling a variety of small lot parts as well as for large volume production.

GISHOLT MACHINE COMPANY
1201 E. Washington Ave. • Madison 3, Wis.

Look Ahead . . . Keep Ahead . . . with
Gisholt Improvements in Metal Turning

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

"With Gulf Lasupar Cutting Oil we increased production per tool grind and improved thread finish"

says this Factory Manager

Actual photo of Factory Manager (center) consulting with a Gulf Service Engineer on results with Gulf Lasupar Cutting Oil in milling breech threads on artillery tubes.

"GULF LASUPAR CUTTING OIL has helped us do a better thread milling job," says this Factory Manager. "A very smooth finish is required —and we get it with Lasupar. This cutting oil also made possible a big increase in production per tool grind—important on this job because the tool is very difficult to dress."

Gulf Lasupar Cutting Oil consistently produces better results on the machining jobs for which it is engineered! This top quality cutting oil may be the answer to your tough, hard-to-speed-up machining operations—and to your requirements for an exceptionally fine finish on the work. Call in a Gulf Service Engineer today and let him demonstrate how Gulf Lasupar Cutting Oil can help you improve your machining practice.

Gulf Lasupar Cutting Oil—and the other quality oils in Gulf's complete line—are available to you through 1200 warehouses located in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf Office.

GULF OIL CORPORATION · GULF REFINING COMPANY

GULF BUILDING · PITTSBURGH 30, PA.

GULF INDUSTRIAL LUBRICATION

GULF QUALITY CUTTING OILS

Gulf Lasupar Cutting Oils A, B, and C
Gulf Electro Cutting Oils A, B, and C
Gulf M-L Cutting Oils A, B, and C
Gulf Cut-Aid · Gulf Cutx B
Gulf L. S. Cutting Base A and B

Gulf Oil Corporation · Gulf Refining Company AM
3800 Gulf Building, Pittsburgh 30, Pa.

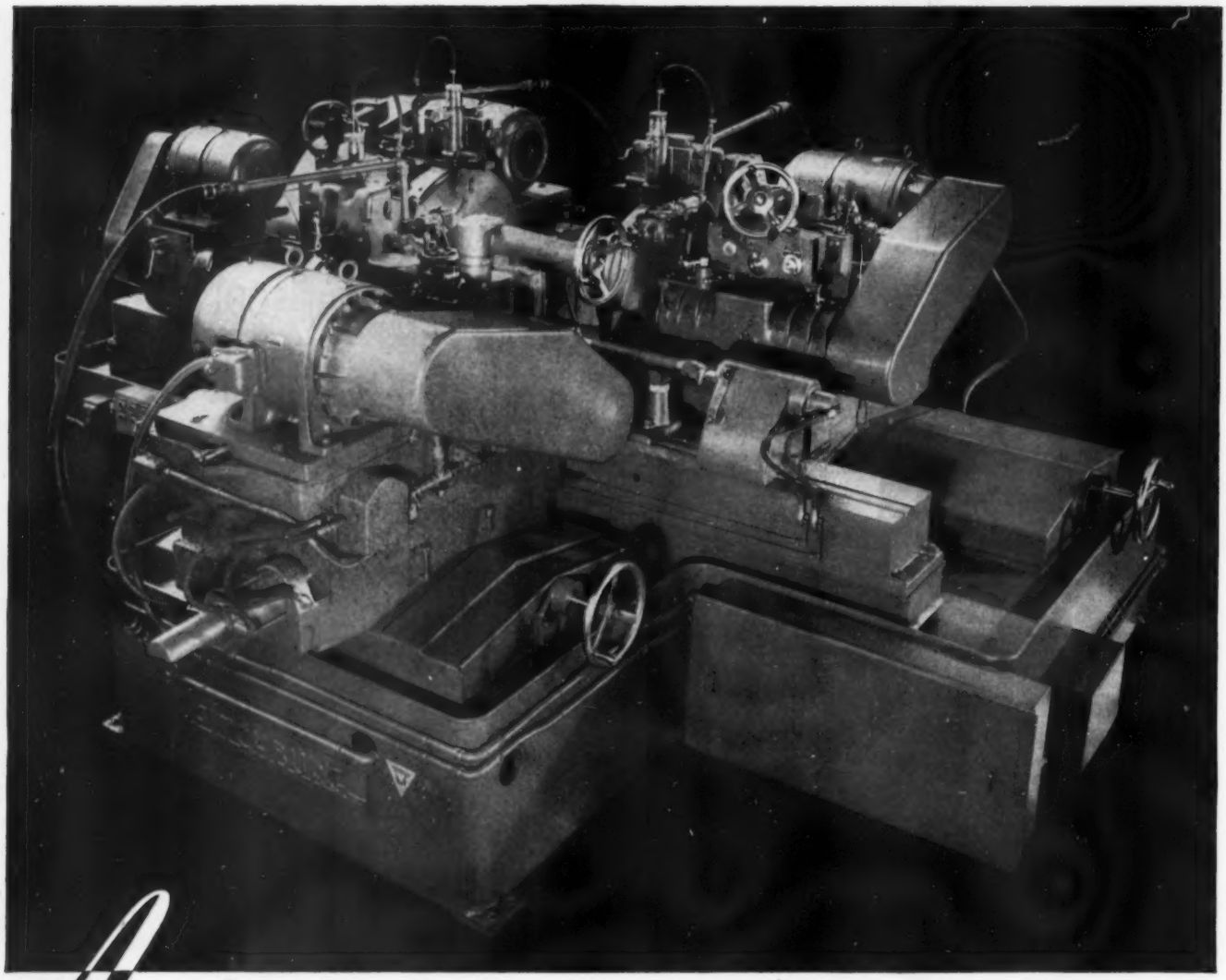
Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

Name.....

Company.....

Title.....

Address.....



Again THREE HEADS ARE BETTER THAN ONE

. . . Because Fitchburg engineers have combined three standard Bowgage Grinding Heads on a special base to plunge-cut grind three spottings on a 96" torsion spring for tanks. All three dimensions are ground at the same time—and within the time of the longest single grinding operation — and in one handling, with the consequent saving in time and reduced danger of spoilage.

Get the complete facts. The open engineering mind instantly makes a favorable comparison between Fitchburg automatic precision grinding and any other equipment on the market! Install the Fitchburg method now and use your "Head" to cut costs and speed production.

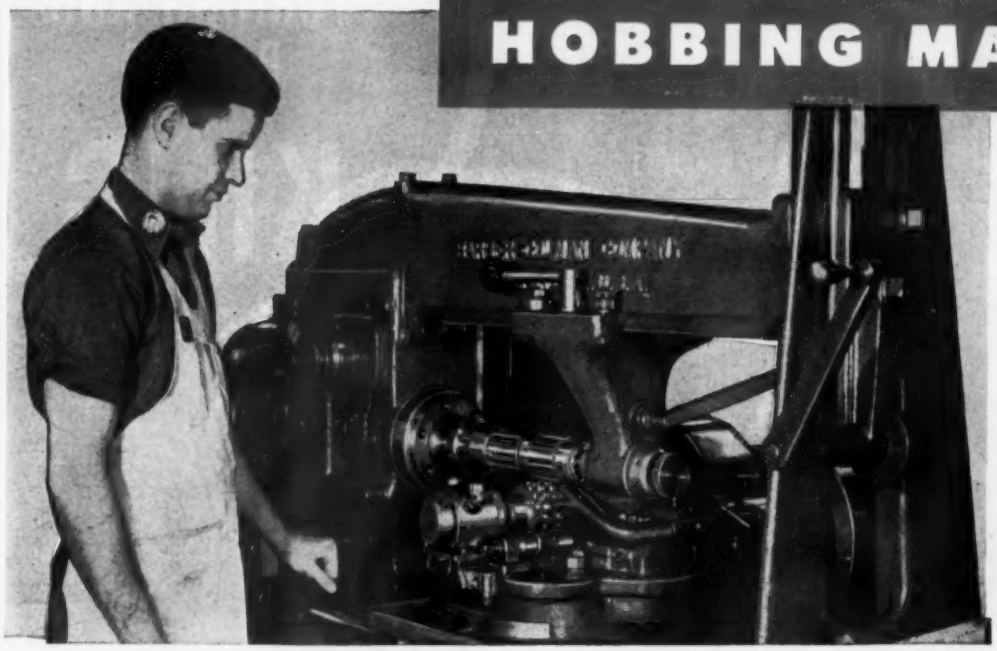
Send your blueprints for our engineers' recommendations. There will be no obligation.

A triple-head Fitchburg Grinder like this may be converted into one double-head grinder and one single-head grinder, or three single grinders. Heads are interchangeable — save your investment.

FITCHBURG GRINDING MACHINE CORP.
FITCHBURG, MASSACHUSETTS, U. S. A.
Manufacturers of — Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders

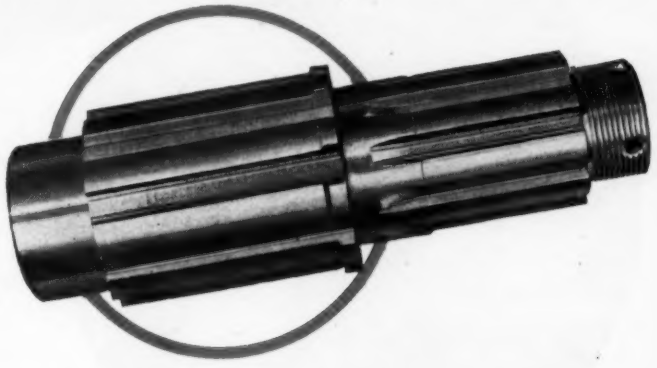
BARBER-COLMAN TYPE "A" HEAVY DUTY HOBBING MACHINE

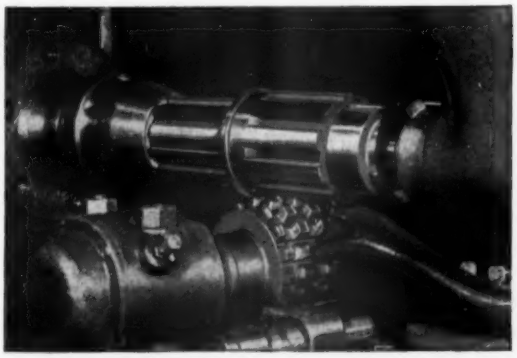
The picture below illustrates how this heavy one-cut spline job in tough, hard steel is set up for accurate high production on a Barber-Colman Type "A" Hobbing Machine.



HOBS SPLINES ±.0005", ON KEY AND ROOT, ONE-CUT IN TOUGH, HEAT-TREATED STEEL

In hobbing these tough 10-key splines, the material is non-uniform and so hard that, if the setting is not to exact size within the close limits specified, it is impossible to go back through and pick up additional stock. Both splined sections shown on this shaft are hobbed on a B-C Type A Hobbing Machine, holding root diameter and key width to ±.0005". Recently redesigned with heavy duty work slide and hob slide, Barber-Colman Type A Hobbing Machines using B-C Hobs can be relied on to hold close limits and give good production on tough jobs.





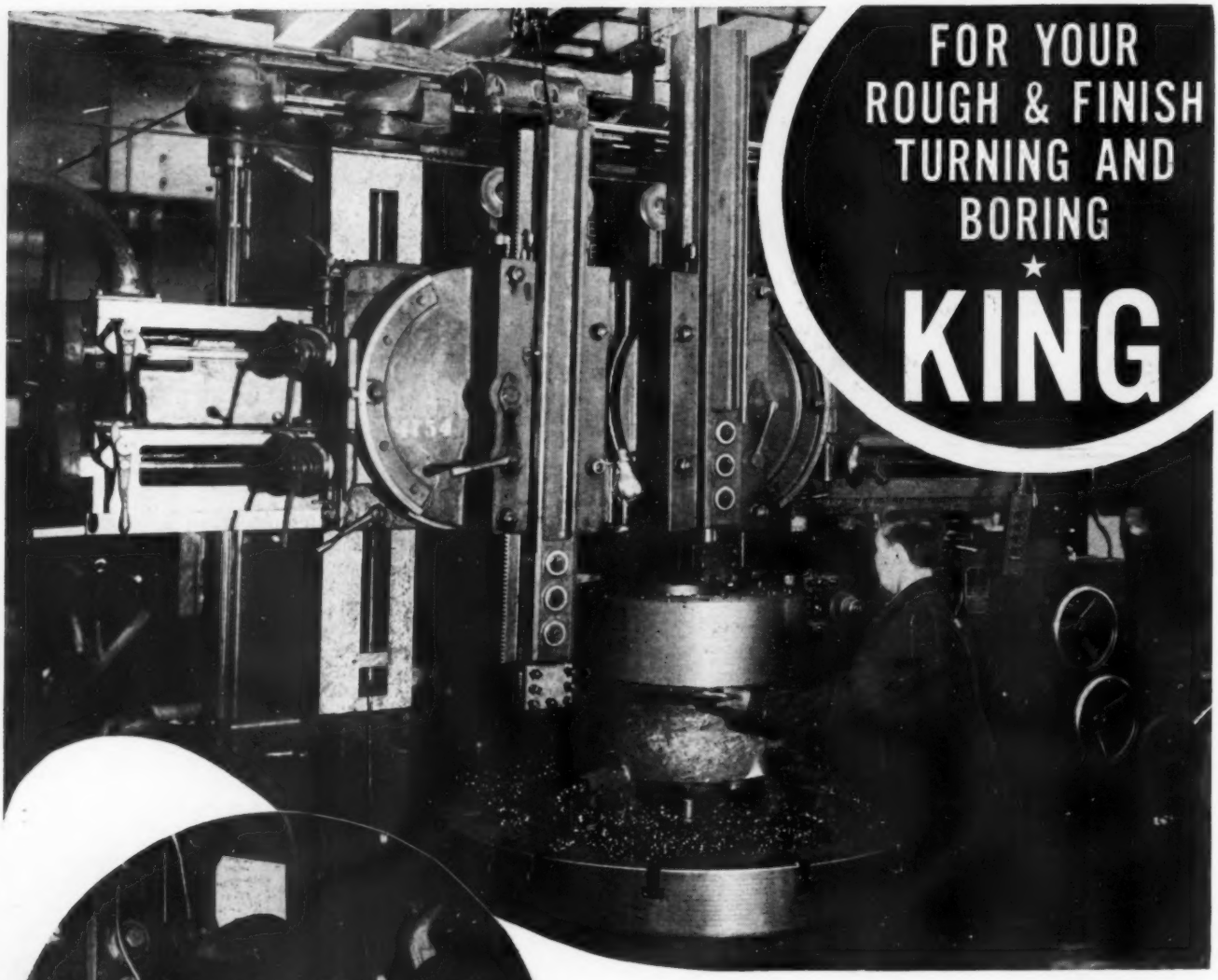
CUT MUST BE ACCURATE AND IN ALIGNMENT WITH SMALLER KEYS

The piece, which is a final drive input shaft for a landing barge, is made of NE 9445 Steel, heat-treated before hobbing to Rockwell "C" 33-37. The larger splines, which must align with the previously-hobbed smaller diameter splines, are 3¾" long, with an O.D. of 2.974". The set-up on the machine uses a hob speed of 60 r.p.m. and a feed of .0375" per revolution of the work. Cutting time is 35 minutes and the hob produces 10 pieces per sharpening. This is excellent tool life considering the hardness of the material and the amount removed in a single cut. *Use B-C Hobs for all jobs, and especially the tough ones.*

BARBER-COLMAN COMPANY

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U.S.A.



FOR YOUR ROUGH & FINISH TURNING AND BORING

★

KING

KING BUILDS

Vertical Boring & Turning Machines exclusively—single column types from 30" to 42" inclusive and double column types 52" up to 12 feet. Consult King on your precision boring and turning operations.

● For your precision work requiring boring—turning—facing you can depend upon King Vertical Boring and Turning Machines for accuracy—finish—and low cost production.

For example on the work shown above 3 cutting tools are working simultaneously. One head is boring center hole—the other is turning the outside diameter—the third is facing the under side of the job. The piece is a Meehanite cast piston and the turning tolerance is plus or minus .002 inch.

At the left a King Vertical Boring & Turning Machine is rough and finish turning 57 inch O.D. steel ring. The cutting tool is of special molybdenum steel and material is S. A. E. 4140 steel.

King Vertical Boring & Turning Machines have both the rigidity to produce precision work and the versatility to perform various operations on a wide range of work. .

THE KING MACHINE TOOL COMPANY

CINCINNATI 32, OHIO

BUILDERS OF VERTICAL BORING AND TURNING MACHINES EXCLUSIVELY

SPECIFY HARDINGE COLLETS FOR ACCURACY AND DURABILITY

When ordering collets only, or when ordering collets with lathes or milling machines of any make or size, specify HARDINGE Precision Collets. Since 1890, HARDINGE collets have been recognized for accuracy and durability.

Write for Bulletin 41 which lists the various standard types, gives engineering data, shows what collets are used in your machines and the attractive prices which apply.

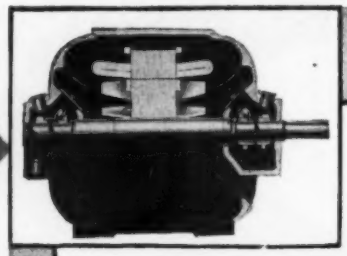
HARDINGE BROTHERS, INC., ELMIRA, N. Y.

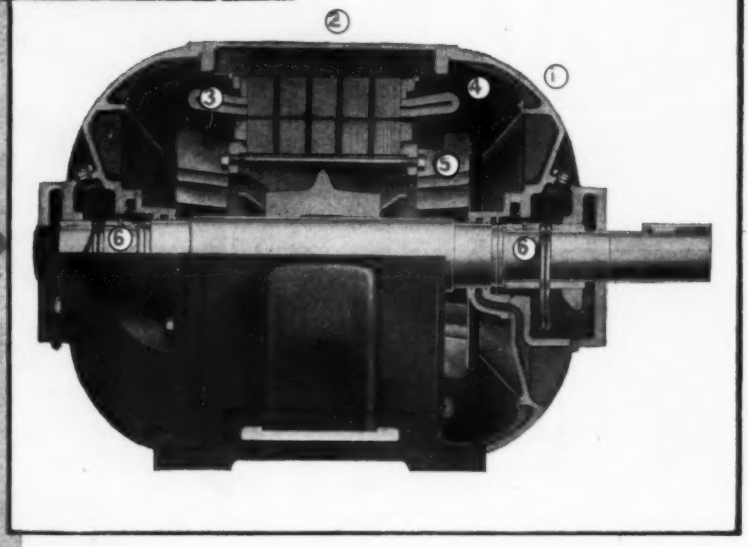
PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

SAME STRONG POINTS OF CONSTRUCTION

from 1 hp

to 2000 hp





Now all your drives — large and small — can have standard G-E Tri-Clad induction motors with the famous protective features that guard against PHYSICAL DAMAGE, ELECTRICAL BREAKDOWN, OPERATING WEAR AND TEAR.

Tri-Clad, in its wide range of types and sizes (recently increased to 2000 hp), is G.E.'s most widely used (integral-hp) motor. For complete details on ratings, characteristics, and dimensions, write for Bulletin GEA-3580. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

HERE'S TODAY'S WIDER RANGE OF STANDARD SIZES	
Tri-Clad Type K (Low starting current, normal starting torque)	1 hp to 2000 hp at 1800 rpm
Tri-Clad Type KG (High starting torque, low starting current)	5 hp to 200 hp at 1800 rpm
Tri-Clad Type KH (High starting torque, high slip)	Available to 100 hp in speeds required for high-slip flywheel drive (punch press, etc.)

1. Cast-iron frame and rigid, cast-iron end shields protect the motor from external blows and accidental abuse.
2. Completely enclosed upper portion of frame guards against entry of falling objects and dripping liquids; keeps chips and the like from vital motor parts.
3. Windings of Formex* wire—one of the toughest magnet wires yet developed—resist heat aging, heat shock, and abrasion.
4. End windings are coated with Glyptal* varnish, providing a tough, hard finish that withstands moisture, oil, and abrasion.
5. Low-velocity, double-end ventilating system keeps the motor running cool and prolongs insulation life. One-piece, cast-aluminum rotor (used on all but the largest sizes), with integrally cast fans, is practically indestructible.
6. Bearings have extra capacity to take heavy shaft loadings from any direction. Lubrication is convenient, its effectiveness well proved.

*Trade-mark reg. U. S. Pat. Off.

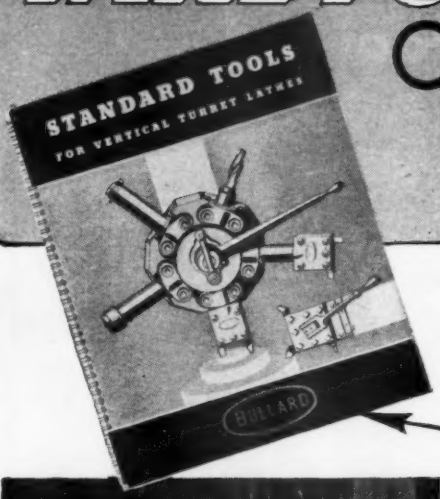
TRI-CLAD MOTORS

Buy all the BONDS you can — *and keep all you buy*

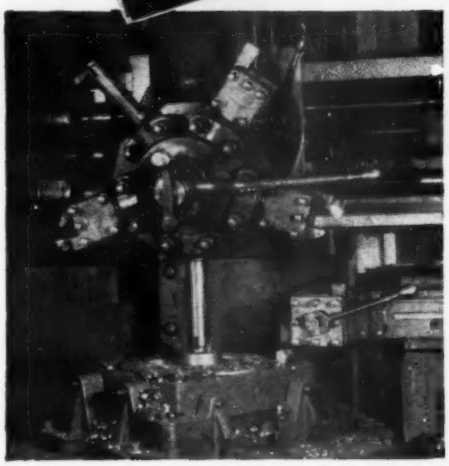
150-256-8030

GENERAL ELECTRIC

TAKE FULL ADVANTAGE OF YOUR MACHINE'S *Ability!*



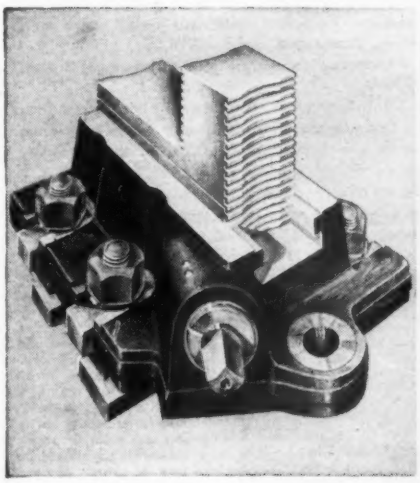
Send FOR THIS *FREE* CATALOGUE..JUST WRITE ON YOUR COMPANY STATIONERY

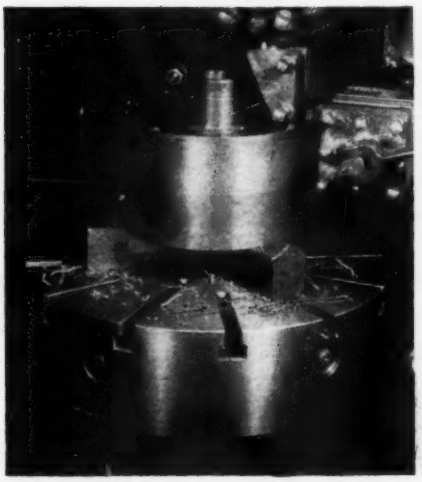


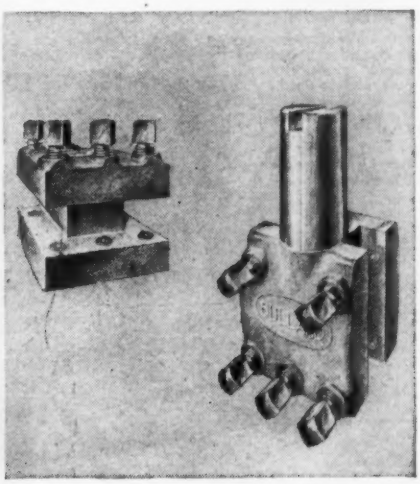
A machine's ability to perform is basically in the machine itself, but no matter how good the machine, it may be hampered by lack of good tools.

Balanced equipment is a valuable asset. Bullard general purpose Standard Tool Equipment for Vertical Turret Lathes is designed for maximum performance. Rugged and quickly applicable to the machine, these tools lower the cost of "change-over" and "set-up." Properly set on the machine they provide a sequence of operations which cuts time between cuts, as well as on cuts.

For your old Bullard Vertical Turret Lathes or your new machines, use Bullard Standard Tools. Ask for catalog RM-STC 7-12-44. This book should give you some profitable tooling ideas.







THE BULLARD COMPANY

"Manufacturers of Machine Tools"

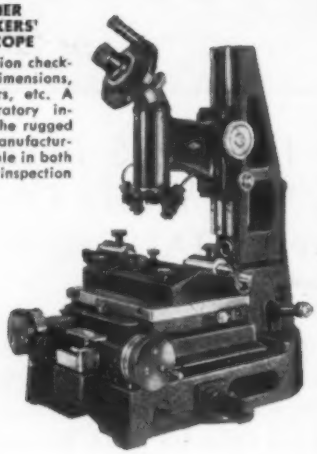
BRIDGEPORT 2 CONNECTICUT

SCHERR
Tools to SEE with

SCHERR MAGNI-RAY
an invaluable inspection tool

GAERTNER TOOLMAKERS' MICROSCOPE

For rapid precision checking of critical dimensions, angles, contours, etc. A scientific laboratory instrument with the rugged strength of a manufacturing tool. Valuable in both tool room and inspection department.



SCHERR BORE INSPECTOSCOPE

For highly magnified and illuminated inspection of bores as small as .110" diam., and as long as 72". Gives right angle or oblique vision of bore surface at any point.

The Model C Magni-Ray

It makes SEEING easy — because it not only magnifies the work under inspection, but also floodlights it with powerful rays of light shielded from the eyes of the operator.

It gives true vision — the immense advantage of two-eye seeing (three-dimensional vision). The lens is ground by experts to avoid all distortion.

Thousands of Magni-rays are serving many large inspection departments today. Thousands more are individually serving on precision machines or critical toolroom operations.

Heavy base permits of swinging the lens to any convenient position, at any height within 14 inches. Lens frame can be quickly removed from base and held in hand for inspecting surfaces on large objects.

MODEL A has 3 in. diameter optical glass lens, 1½ x plus (depending on focusing). The most popular type for general inspection. Complete with two bulbs, cord and switch, swiveling clamp and stand — $18.50.

MODEL B achromatic lens magnification power of 3 plus. Complete, $27.50.

MODEL C for larger work, has 5 in. optical glass lens of 1½ x plus. Handle on Magni-Ray unit for convenience in holding it in the hand, detached from the base by quick-release swiveling clamp. Complete, $33.00.

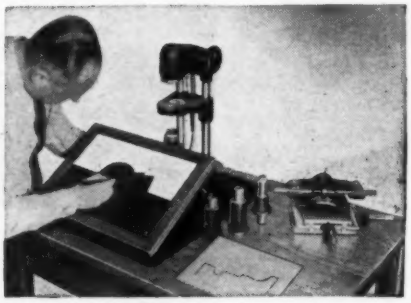
If in doubt, try one Magni-Ray — and learn why this seeing tool is so commonly seen in so many shops. Shipment at once. Further details on request.

SPENCER BINOCULAR MICROSCOPE

Permits three-dimensional vision at high magnification in inspecting small parts, contours, surface finish, etc. Choice of objectives, .7 x to 8 x and of eyepieces, 9 x to 18 x. Essential wherever materials must be inspected for surface flaws, scratches, irregularities.

SURFACE FINISH STANDARDS

When used with Spencer Microscope, aids uniformity in surface finish by supplying comparison standards. All specimens clearly marked and graded.



WILDER MICRO PROJECTOR

Throws magnified shadow image of work for comparison with master drawing. Most accurate way to check small parts, threads, gears, odd forms. Ideal for checking tool wear on screw machines by periodical inspection of work. Many other uses. Write for descriptive bulletins.

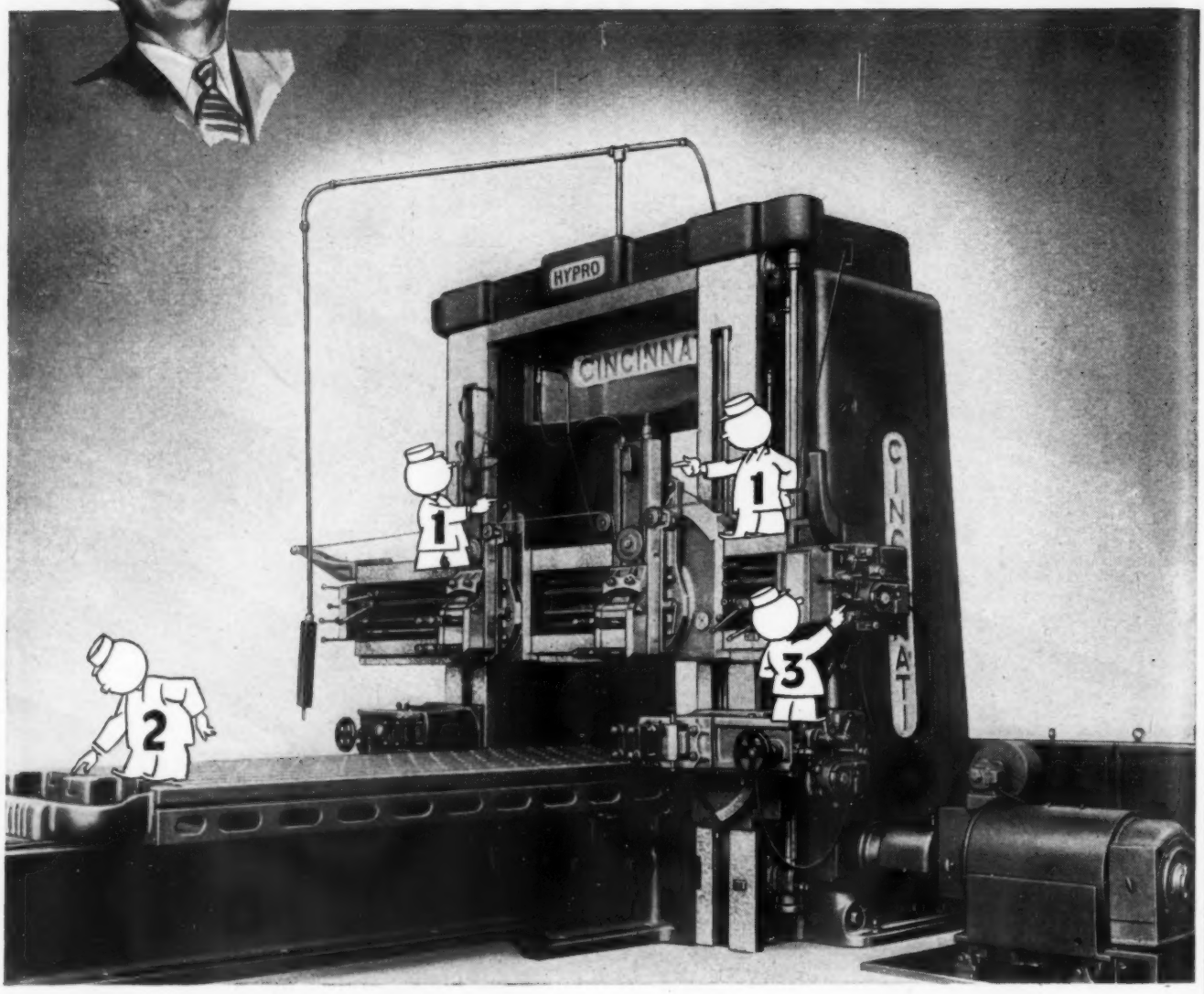
GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.

NORBIDE Gages are outwearing conventional measuring devices 200 times and more. Made of Norton Boron Carbide — "the hardest material made by man for commercial use" — NORBIDE Gages show exceptional resistance to abrasion and scratching. They will not pick up lint nor become charged with particles of metal and they are inert to chemicals employed where gages are used. NORBIDE blanks for plug, ring, snap and keyway gages and NORBIDE contact points for dial indicator gages can be obtained from your regular gage supplier. For an interesting booklet on NORBIDE Gages write for Catalog #1100 to:

NORTON COMPANY - WORCESTER 6, MASS.

NORBIDE is a Registered Trade-mark

—and no other planer has these PATENTED ADVANTAGES



ONLY HYPRO PLANERS give you all these advantages

1—Hypro Pneumatic Tool Lifters

With a new patented cam and snubber arrangement, the Cincinnati Hypro Pneumatic Tool Lifter provides uniform acceleration and deceleration, with soft reseating action, of the Tool Block. The setting of the tool is not disturbed, which is especially valuable on finish cuts.

2—Hypro Renewable Steel Inserts in Table T-Slots

Hypro Table T-Slots are fitted with renewable steel inserts, protecting the original condition of the T-Slots and Table throughout the life of the machine.

Removal of work chips is more easily accomplished as they will slide freely on the smooth steel inserts.

3—Hypro Electric Dial Feeds

Independent feed changes are provided for the Rail and Side Heads. Feed is set instantly by the operator. A partial turn of star knob unlocks and changes feeds. When released, feed dial is automatically locked. Feed for any head may be changed at any position or direction of the table and fed at either end of stroke.

All pins, pawls, ratchets and other parts subject to wear have been eliminated, providing long life and minimum servicing for this mechanism.

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

A loop of "camelback" between extruder (background) and receiving conveyor actuates a photoelectric control to maintain the Thy-mo-trol driven conveyor at the right speed.

Thy-mo-trol control panel (cover removed), which controls the speed of the d-c conveyor motor.

ELECTRONIC SPEED-MATCHING of tire-tread machines

helps raise production 100%

Continuous production of "camelback" tire-tread at the plant of W. J. Voit Rubber Corporation, Los Angeles, is now maintained at twice the former rate, using a new speed-matching system which combines a photoelectric control and a G-E Thy-mo-trol drive.

At speeds ranging from 8 to 80 feet per minute, a receiving conveyor is kept in step with an extruder—avoiding "pile-ups" or breaks in the strip between the two machines.

VERSATILE SPEED CONTROL

This arrangement for automatic speed control is typical of dozens of ingenious applications employing Thy-mo-trol drive, on production lines as well as on individual machines. Powered directly from an a-c source, Thy-mo-trol is an adjustable-speed drive with exceptional control characteristics. It gives stepless speed control over a wide range, holds speeds constant under changing loads, and offers rapid, controlled current acceleration and dynamic braking. Speeds can be pre-set from a small dial that's part of the push-button control station.

A COMPLETE DRIVE

Standard Thy-mo-trol drives are available from 1/8 to 25 horsepower. And larger sizes can be furnished. Four compact units—d-c motor, electronic panel, power transformer, and control station—make up the complete drive. For full information, call your local G-E representative. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

670-191

THY-MO-TROL DRIVE

Keep on buying BONDS—*and keep all you buy*

ALL THIS *and*

PRECISION *too*

BALL TURNING

SPIRAL CUTTING

MILLING

GRINDING

MULTIPLE OPERATIONS

RELIEVING

SLOTTING

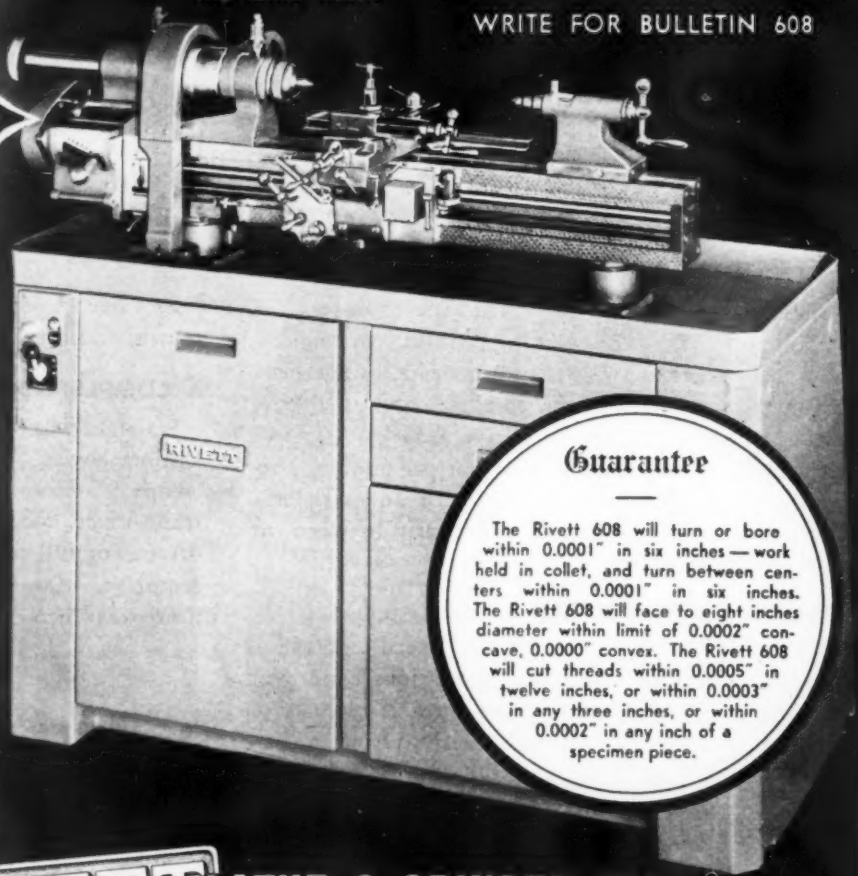
FORMING

TAPER TURNING

All possible through precision-made attachments.

No. 608 back-geared, screw cutting, bench lathe for tool making and instrument shops where handling of a greater variety of jobs in minimum time is important. This small but exceedingly proficient lathe with slide areas equal to that of one twice its size permits the operator to finish his work completely without employing other machines, and, throughout the entire series of operations, utilize the inherent precision of the lathe itself.

WRITE FOR BULLETIN 608



Guarantee

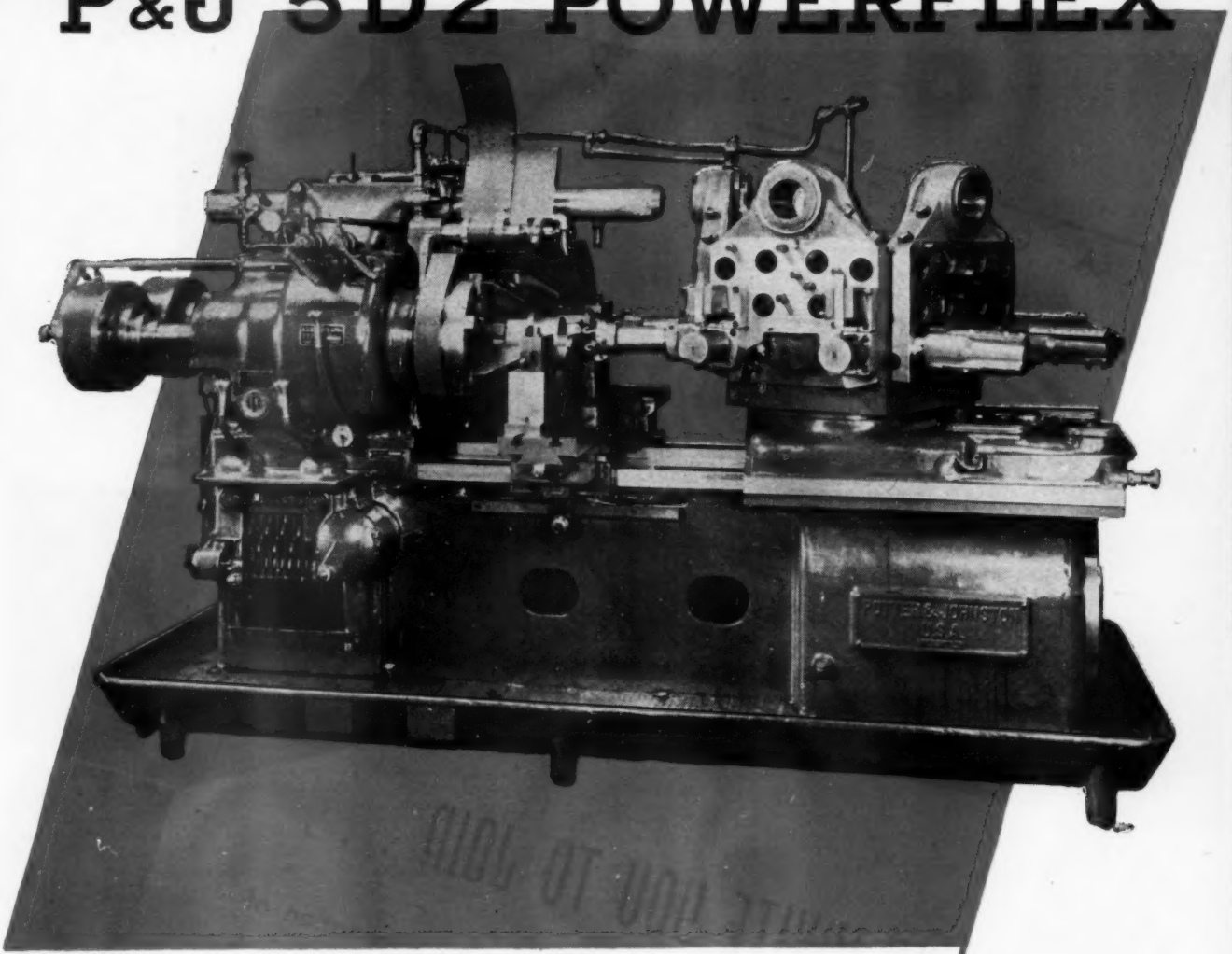
The Rivett 608 will turn or bore within 0.0001" in six inches — work held in collet, and turn between centers within 0.0001" in six inches. The Rivett 608 will face to eight inches diameter within limit of 0.0002" concave, 0.0000" convex. The Rivett 608 will cut threads within 0.0005" in twelve inches, or within 0.0003" in any three inches, or within 0.0002" in any inch of a specimen piece.

RIVETT LATHE & GRINDER INC.

BRIGHTON, BOSTON, MASS., U.S.A.

ARMY E NAVY

P&J 5D2 POWERFLEX



When you need greater productive capacity than is possible with single spindle machines

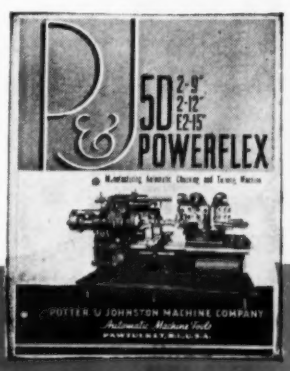
For any work within its range, the P&J 5D2 Powerflex assures an output per machine far in excess of that obtained with a single spindle unit. The 5D2 is the logical development of the single spindle 5D Model which long ago established its place among recognized high production machines.

Power and rigidity are offered in this machine as well as four automatic changes of spindle speed while under cut, three selective automatic changes of feed, automatic binding of turret following index, direct cross slide action and a constant high speed motion to cross slide and turret slide.

These and other outstanding features are fully described in Bulletin 120, available promptly on request.

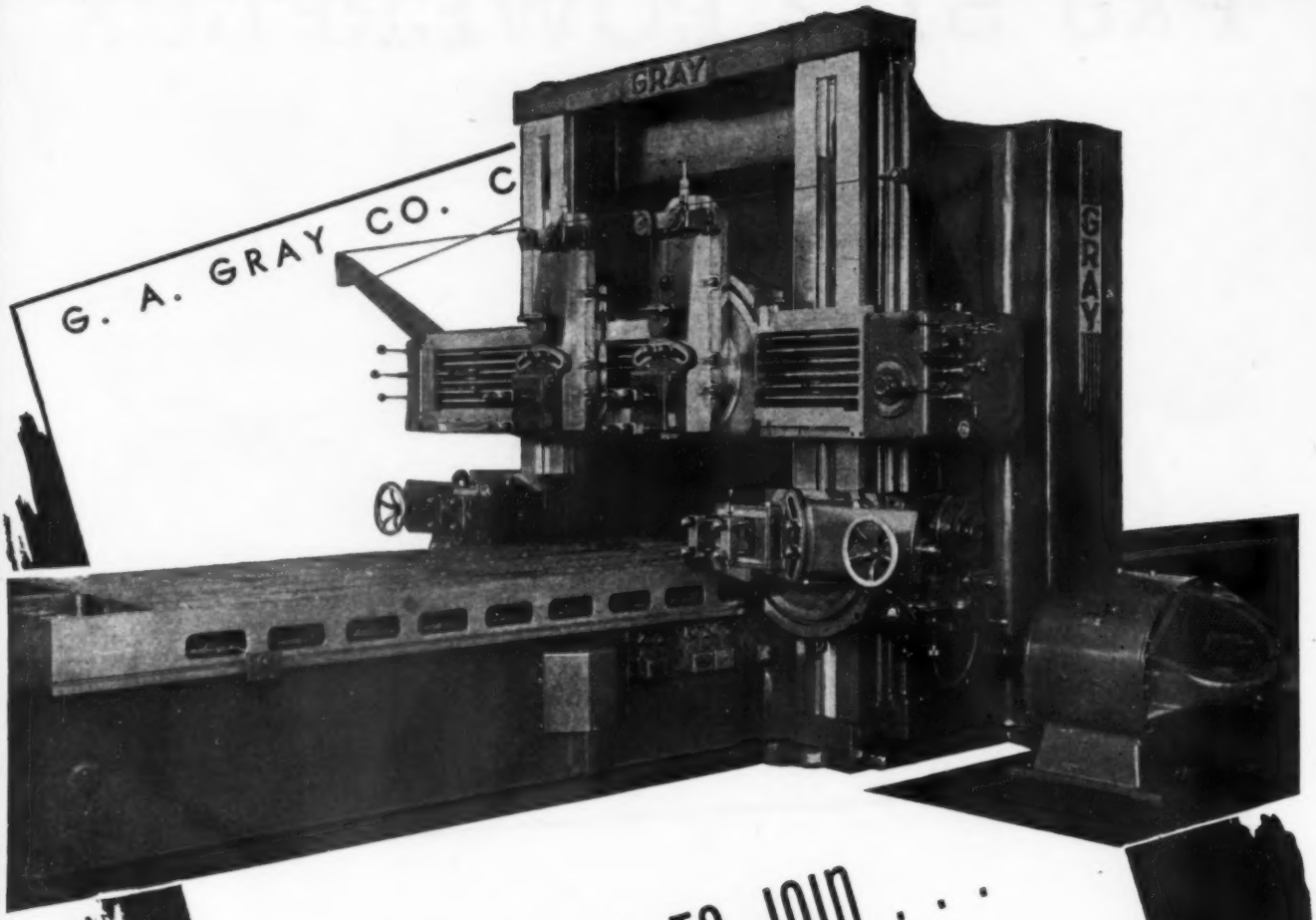
MADE IN THREE MODELS AS FOLLOWS

	Cross Slide Travel	*Swing over bed*	*Dist. between spindles*	*Turret faces*
5D 2-9"	5"	21½"	10½"	5 or 6
5D 2-12"	5"	23"	15½"	5 or 6
5D 2-15"	5"	28"	15½"	5 or 6



POTTER & JOHNSTON MACHINE CO.,
Pawtucket, R. I.

BUY MORE VICTORY BONDS AND HOLD THEM

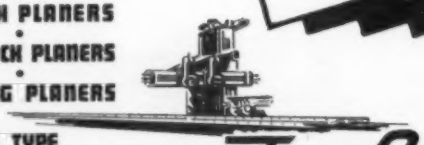


WE INVITE YOU TO JOIN . . .

The anti-scrape society for the elimination of unnecessary scraping. Initiation fee is one Gray Planer. On payment of fee you become a life member. Members never resign . . . they always boost. When taking you thru their plants they proudly point to the badge of the society . . . A GRAY PLANER.

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
•
DIE BLOCK PLANERS
•
MILLING PLANERS

PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES



The G.A. GRAY Co.

CINCINNATI 7, OHIO, U. S. A.

Now! CHECK BORES FASTER more accurately

NO PILOT NECESSARY

DuBo

SINGLE END
Sizes 1.510" to 6.010"
(38 mm. to 152 mm.)

DOUBLE END
Sizes .240" to 1.510"
(6 mm. to 38 mm.)

PATENTS PENDING

...that New, Better PLUG GAGE by STANDARD

HERE is a radical improvement over old-style, limit plug gages. DuBo is designed for greater ease - in - use, finer precision, more thorough inspection, faster gaging. Its unmatched lightness and balance give finger-tip control and amazing sensitivity in revealing internal bore conditions ordinarily passed over by common cylindrical plug gages.

Write for Special Bulletin.

DuBo Tells More...More Easily

Spherical gaging surface, chamfered, relieved and self piloting, enables DuBo to be inserted easily into bores of extremely close tolerance.

Out-of-roundness, taper, belling and dimensional deviations revealed by unmistakable tilt of handle.

May be used in deep bores and close to the bottom of blind bores.

Finger-tip "feel" and control reveal internal conditions at any point in the bore. Light weight minimizes fatigue.

Plastic color signals, Green for Go, Red for Not Go, make identification easy, prevent errors in reading.

Chamfered edges automatically wipe bore and help prepare a clean surface for accurate gaging.

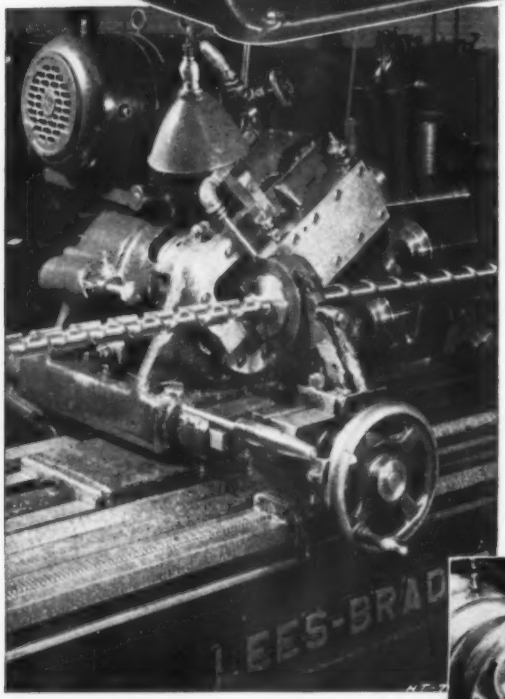
STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

PRECISE ENGINEERING FOR PRECISION PRODUCTION

LEES-BRADNER

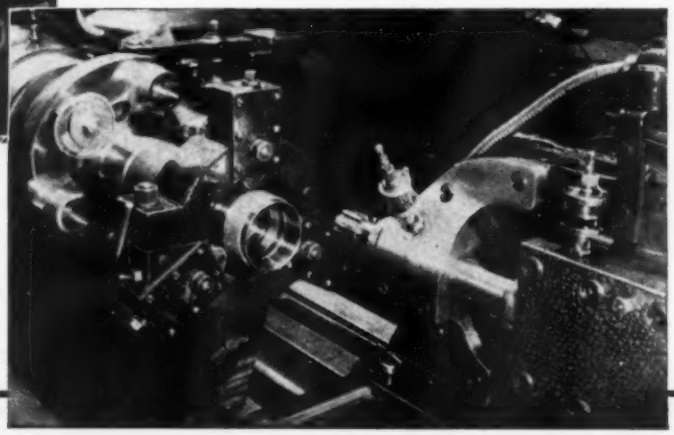
HEAVY DUTY THREAD MILLER

● This Heavy Duty Thread Miller is suitable for internal or external thread milling using either a disc or a ring type cutter. It combines in a single machine processes which previously necessitated two and often three machines. Due to its inherent ruggedness feeds and speeds far in excess of previous practice are possible. The result is particularly accurate threads in considerably shorter time with resultant lower cost. Ask for Bulletin.



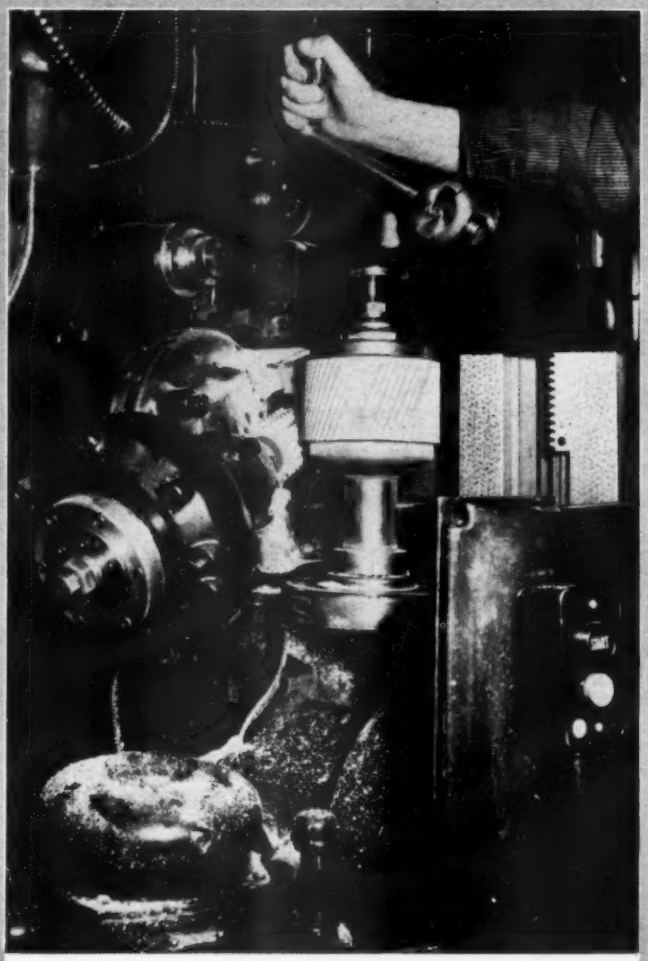
Above—Lees-Bradner Heavy Duty Thread Miller generating right-hand thread on a Rapid Traverse Screw for a well-known lathe manufacturer.

Right—Lees-Bradner HT Threading Machine milling an internal thread on the propeller shaft of a radial aircraft engine.

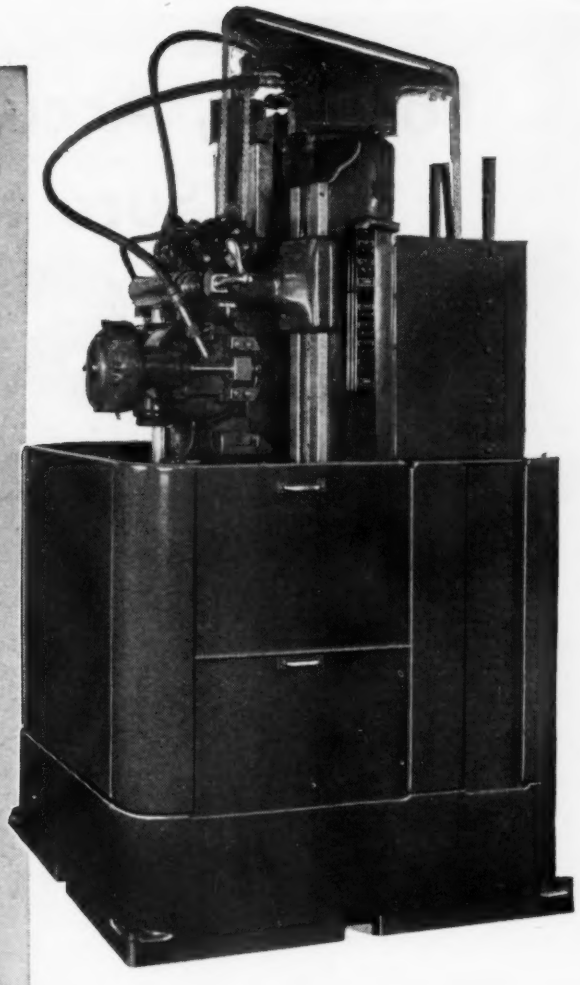


The HT Thread Miller is available in several lengths, has a diameter capacity of 12" and will handle work up to 2½" circular pitch.

7-A SINGLE SPINDLE *Automatic* PRODUCTION HOBBER



● The Hobhead on the Production Hobber arranged for quick, accurate axial shifting of the hob, incorporates a new unit: the entire back gear ratio is contained in the swivel head. Since all the reduction is so taken, chatter and back lash, already reduced by hob spindle bearing construction is further minimized.



● This sturdy, automatic, high production machine will cut straight or taper serrations, spline shafts, spur gears, worm wheels, helical gears—right or left hand and angles up to 45 degrees. It will take gears up to 7" OD and 9" face and pitches up to 4 diametral pitch in steel.

It is extremely easy to operate and with relatively unskilled labor. Operator merely loads machine and presses start button. All functions of machine are automatic including accelerated back off and automatic stop at completion of cycle.

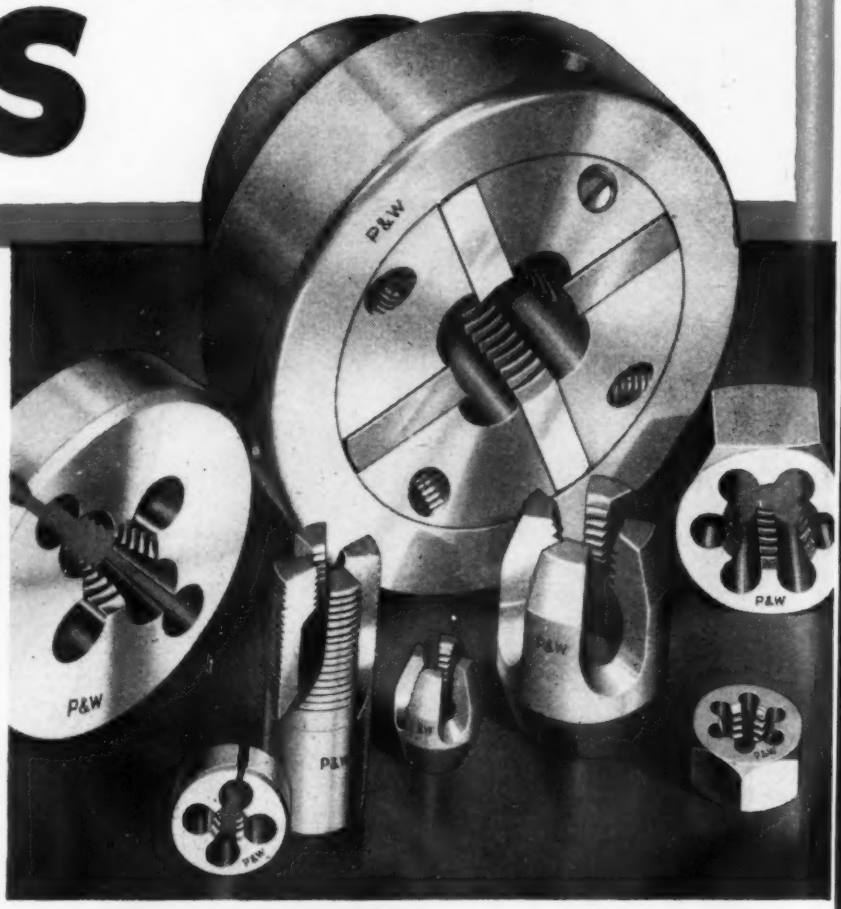
For precision gear and spline work, at high production rate and at low costs put the job on a Lees-Bradner 7A Production Hobber. Furnished in Single Spindle and Rotary models in 4-6 and 8 spindles.

The LEES-BRADNER *Company*

CLEVELAND 11, OHIO, U.S.A.

For Fast, Accurate Threading . . . be Sure to Specify P&W

DIES



PRATT & WHITNEY makes a complete line of thread cutting dies for all purposes . . . and in a full range of sizes. Dies are available for use in hand stocks and for screw machines, turret lathes, bolt cutters, staybolt threading machines, etc. No matter whether it is ordinary threading or fine precision work, we will furnish the correct dies with the quality and accuracy for which Pratt & Whitney has been famed for 85 years. We suggest that you write us for a complete listing and prices . . . or call one of our branch offices — they might have the dies you need right at hand. Remember if our standard dies cannot fit your needs, we can easily give you precision-built dies to your own individual specifications.

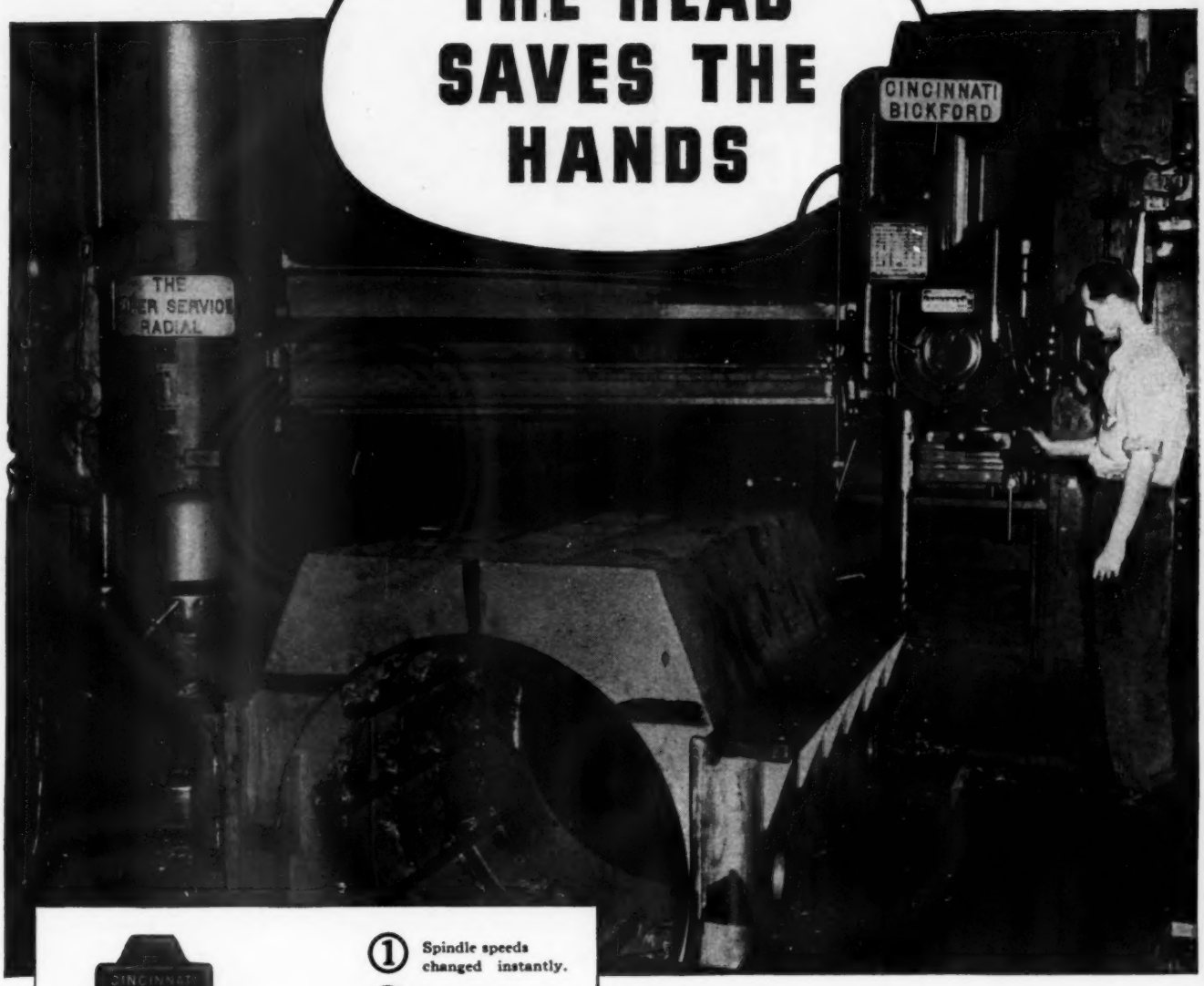
The P & W Duocone Die is light, strong, compact . . . designed for machine use. It is inexpensive and does a remarkably fast, accurate job of threading.

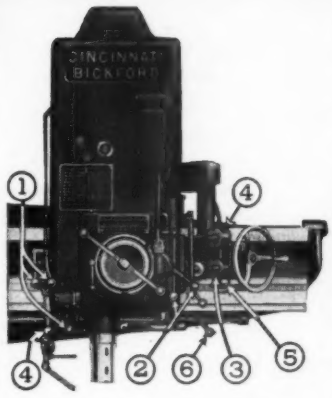
PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

THE HEAD SAVES THE HANDS





1. Spindle speeds changed instantly.
2. Feed changes instantaneous.
3. Push button power column clamping.
4. Arm elevation and electric arm clamp.
5. Power rapid traverse of head.
6. Start, stop, and reverse spindle lever.

Equal Efficiency of Every Unit Makes the Balanced Machine.

This eight-foot Cincinnati Bickford Super Service Radial Drill is saving time drilling seven holes on each side of this large casting. The job is completed without moving casting. Here again you see how Cincinnati Bickford centralized controls are saving time and operation fatigue.

Write for detailed Bulletin R-24 A.

See our condensed catalog in Sweet's File.

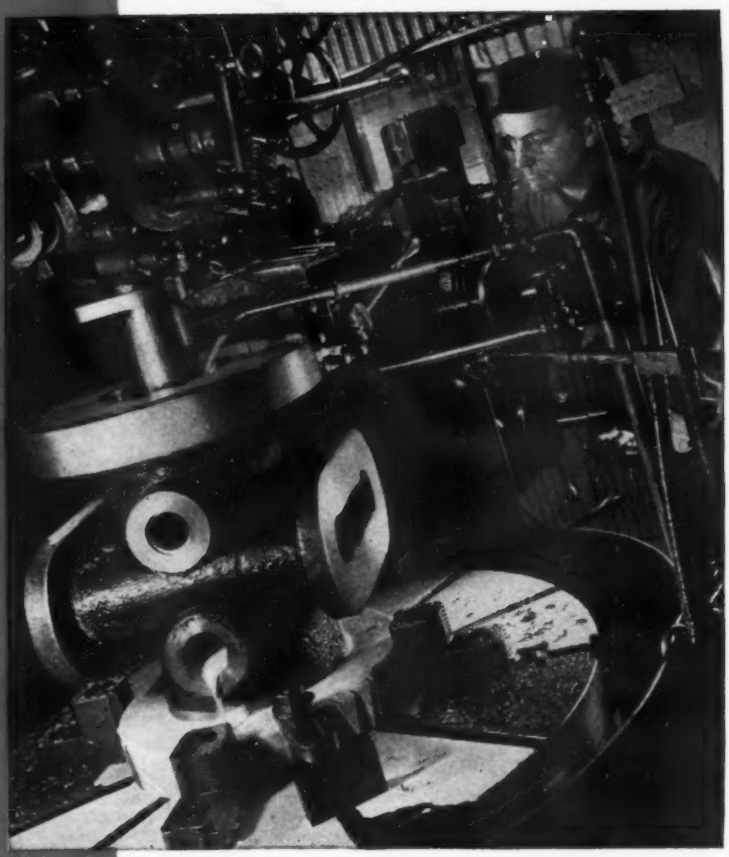
RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO. CINCINNATI 9, OHIO, U. S. A.

FASTER, FINER MACHINING at LOWER COST

when cutting fluids...

- ★ Lubricate and cool the tools
- ★ Prevent chip welding
- ★ Permit higher cutting speeds
- ★ Prolong tool life
- ★ Improve surface finish



WHATEVER the metal or the method of machining, you can cut faster, better, and more economically with *Texaco Cutting and Soluble Oils.* These superlative cutting fluids not only bring you the benefits headlined, but assure more cuts per tool grind, less downtime for tool changes.

There is a complete line of Texaco cutting fluids, each designed to improve the efficiency of a particular type of cutting. Each has been developed through careful research and practical field applications . . . and each is kept abreast of advances in metallurgy and machining techniques by the continuing work of The Texas Company's staff of research chemists and engineers.

A Texaco Engineer specializing in cutting coolants will gladly help you improve your machining procedures. Get in touch with the nearest of more than 2300 Texaco distributing plants in the 48 States, or write to The Texas Company, 135 E. 42nd St., New York 17, N. Y.

RECONVERSION RUSTPROOFING

4 Points to Remember

1. Ordnance Specification P.S. 300-4 contains *official instructions* for the complete processing of Government-owned production equipment.
2. These instructions require that only rustproofing materials meeting Government specifications be used.
3. *Texaco rustproofing products meet Ordnance specifications for application on Government-owned equipment.*
4. For full information, see your Texaco representative or write to us.

TEXACO

TEXACO CUTTING, SOLUBLE AND HYDRAULIC OILS FOR FASTER MACHINING

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

More Important Than Soldiers

NEVER has any country demobilized at such a headlong pace as we have since V-J Day.

Our desire to get away from war and back to peacetime pursuits is reflected in several ways. We are ahead of schedule in reconverting our industrial facilities.

In the rush to demobilize our superb wartime organization at home as well as at the front, we should keep in mind our future needs and not do things helter-skelter without a thought for the nation's safety in the years ahead.

To make this point clear, consider for a moment the disposal of government-owned surpluses of machine tools and other production equipment.

The statement has been made—and not disputed—that our reserves of machine tools are being dissipated in front of our eyes and nobody in Washington seems much concerned about it.

The machine tools owned by the government were built under feverish pressure mostly while Britain and Russia were holding off the enemy until our enormous industrial resources could produce enough weapons for victory.

Though the war ended in August and the services are declaring surplus more and more machines week by week, we have not yet had evidence of any clean-cut and comprehensive plan for retaining an ample supply for a possible future emergency.

To let these machines be scattered to the four winds would be a major blunder and a national tragedy. Who in the Army and Navy or elsewhere in government is willing to answer for such dereliction of duty?

Without further delay a survey should be made of our government-owned machine tool resources with an eye on what our requirements might be if an enemy struck again.

All of the special machines and all of the heavy machines that take months to build should be set aside and not sold to anyone. In addition, large numbers of general-purpose machines should be selected as part of the national reserves.

The exact number to be retained can only be determined by a survey. It is conceivable that up to one-half of the total owned by the government might be earmarked for retention. In any event, it would be common sense to err on the side of keeping too many rather than too few.

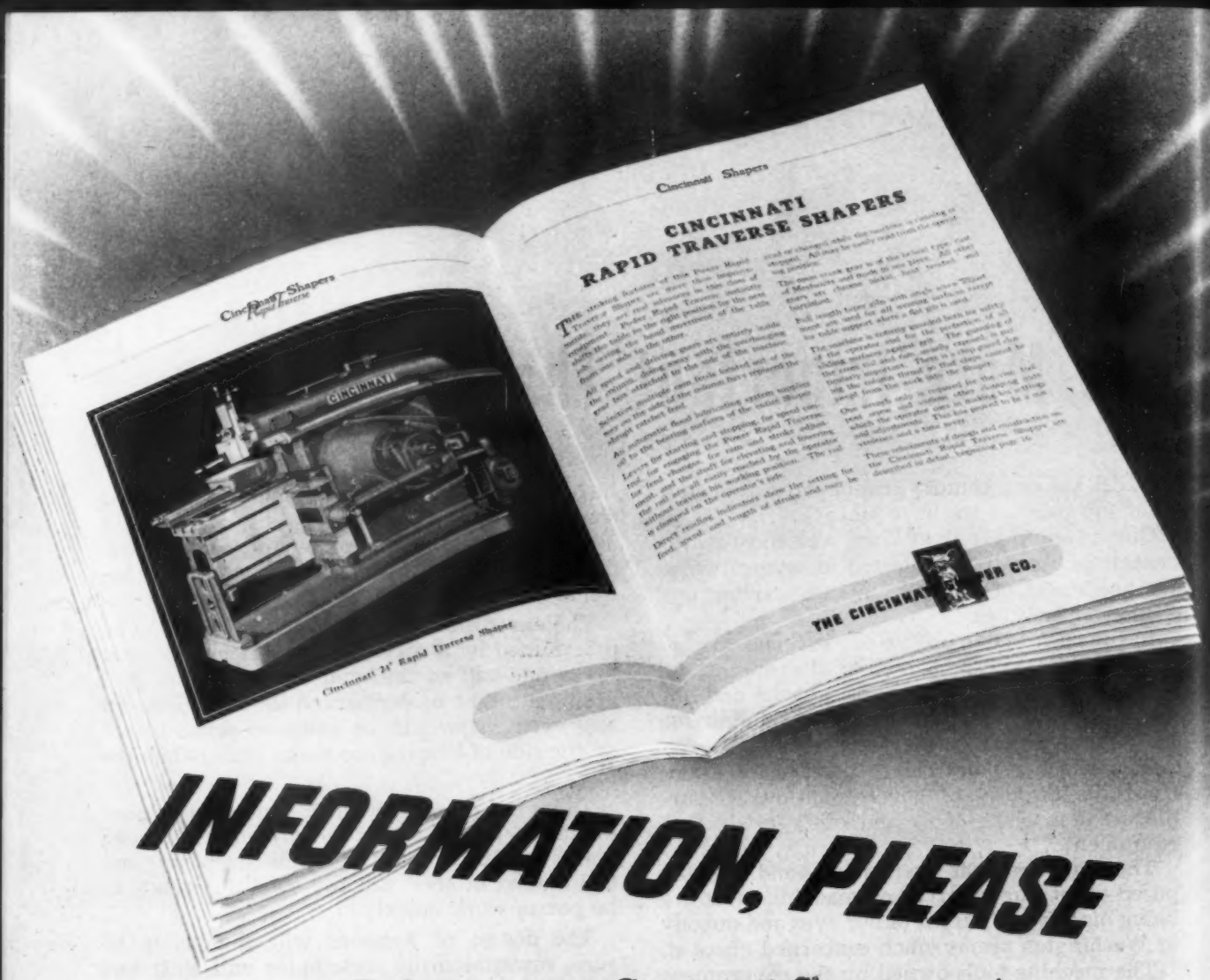
The earmarked machines should be placed in warehouses (many of the government-owned plants could be used for this purpose) and maintained in good standby condition ready to be put to work quickly.

The design of weapons will change, to be sure, manufacturing techniques will shift and the machines stored for use another day will steadily become obsolete. But their productive ability in an hour of emergency in this atomic age might spell the difference between quick, ignominious defeat and a solid victory. They would be the shock troops with the assignment to do a job in a critical hour until fresh reserves could be created and thrown into action.

In our hour of victory we cannot afford to be careless of our future safety as a nation. We should not strip ourselves of the machine resources essential in an emergency. We should determine at once our reserve needs and take action to insure retention of the requisite number.

Too often we forget the truth of Leo Crowley's statement before the Senate Military Affairs Committee last June, "Machine tools are much more important in modern war than soldiers."

Burnham Finney



INFORMATION, PLEASE

Today, as ever, Cincinnati Shapers are indispensable in both the large plant and the small shop. Such Cincinnati features as built-in power rapid traverse to the table, multiple cam feeds, direct reading indicators bring to the user of a single machine or of many machines an outstanding usefulness.

Write for informative book N-3 on the complete line of Cincinnati Shapers.

THE CINCINNATI SHAPER CO.

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SHAPERS · SHEARS · BRAKES

Jigs and Fixtures Can be Simple

BY BEN C. BROSHEER, ASSOCIATE EDITOR

Drilling, tapping, reaming and countersinking of thousands of holes each day are done to close limits at high production rates with easily operated units

THOUSANDS of small holes are drilled and reamed or tapped in parts every day at the Carter Carburetor Corporation plant. All parts are relatively small and light. The large quantities involved, and the close tolerances which must be held, make it economical to provide fixtures for almost every drilling, reaming and tapping operation.

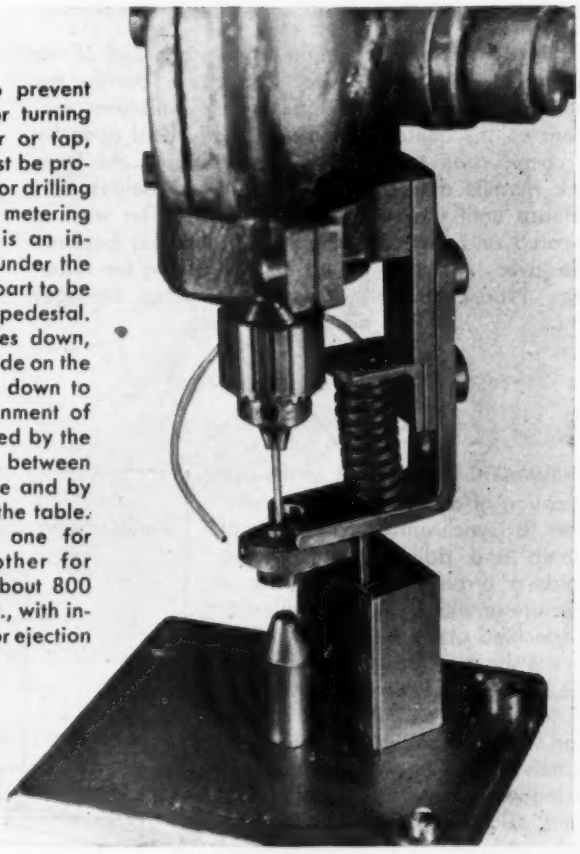
Careful analysis led to development of several types of simplified fixtures designed to hold the part without clamping, or to provide means for automatic clamping during downward travel of the drill spindle and for releasing during the return travel.

Motion-time analysis and tool design were coordinated so the operator can handle a maximum number of parts with minimum fatigue and drill breakage. So efficient are these jigs and fixtures that today there is not a box-type fixture in use in the plant.

Depending upon size and shape, the piece may be removed from the fixture by an air jet or by hand. Where a number of drill spindles in line are used for progressive drilling, reaming and tapping, as in the die-cast body of a carburetor or air horn, the operator frequently moves the part by hand.

Both pedestal and bench sensitive drillpresses are employed, in many cases fitted with treadles for foot feed. This frees both of the operator's hands for handling work. Where possible, an air jet moves the released part automatically into a chute for delivery to the tote pan under the bench. Similar jets are used almost universally for keeping working surfaces of fixtures clear of chips. Where it is not desired that the part be dropped into a chute, drop delivery places the parts on a pile on one side of the table.

An interesting application of an air jet for discharging finished pieces is found in the drilling of a cross-hole in a small cylindrical brass setting pin for a bomb fuze. At the closed end of the horizontal counterbored hole in which the part is located is a small drilled hole leading to an air line. Air pressure is on constantly. The operator loads a piece into the hole with her left hand, holding it in place against the pressure of the air while, with her right hand, she feeds the drill through a hardened bushing. When the drill has entered, she can remove her left hand to secure the next piece. After the hole has been drilled and the spindle is raised,



HOLD-DOWN—To prevent parts from lifting or turning with a drill, reamer or tap, some hold-down must be provided. Here, in a jig for drilling a brass carburetor metering jet, the hold-down is an inverted cup directly under the guide bushing. The part to be drilled is held on the pedestal. As the spindle comes down, the spring-loaded slide on the quill bracket comes down to hold the work. Alignment of drill and jig is assured by the vertical guide bar between bracket and jig base and by bolting the base to the table. Two of these jigs, one for drilling and the other for reaming, turn out about 800 finished parts per hr., with intermittent air blast for ejection

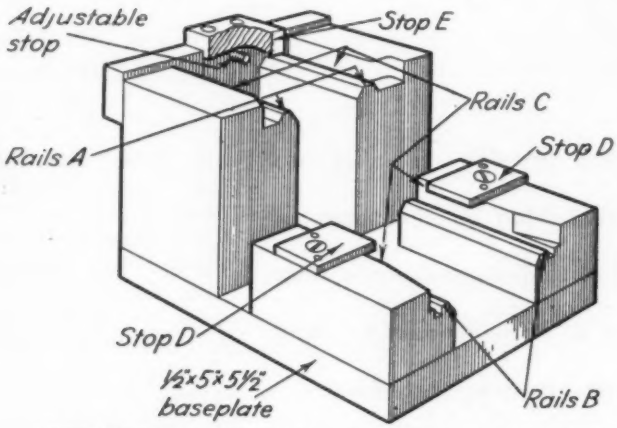
air pressure behind the piece forces it out of the jig and into the chute.

On sensitive drillpresses, air requirements are so small that tiny copper-tube jets are bent to direct the air as needed. Frequently two or more jets are used on the same fixture. In drilling a brass carburetor-needle seat in a sensitive drillpress, for example, the jig is arranged for automatic clamping and air ejection to a chute. Two air jets eject the part. A vertical jet lifts the part out of the jig jaws, while cleaning away chips. Immediately above the jaws is a horizontal jet which directs a blast of air to blow the piece into a chute. Air-blast jets usually are left open as operations are so rapid it does not pay to operate valves for each cycle.

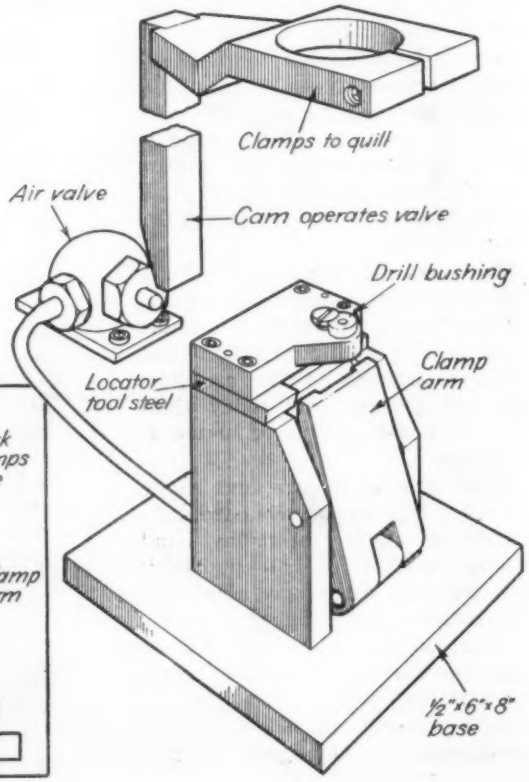
One line arranged for drilling, tapping and reaming a number of holes in either of two die-cast air-horn bodies has 15 spindles in line. The line is made up by mounting four 4-spindle machines side by side, with steel plates connecting the tables to make a continuous work surface. One operator takes care of each group of four spindles, except at the last station. Production from the lines averages about 275 to 300 castings per hour.

Details of typical jigs and fixtures are given in the accompanying illustrations and captions. They illustrate the principles applied on similar units throughout the plant.

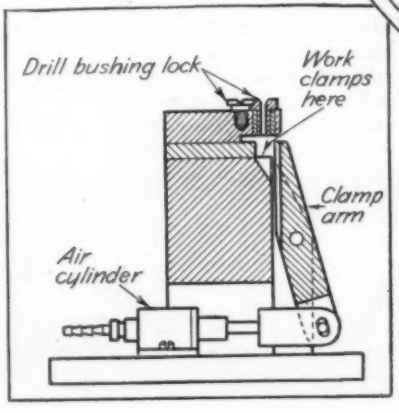
CAM ACTUATION—For countersinking one end of the carburetor low-speed tube, this fixture clamps the work through action of the jaw cam-and-lever element on the quill. Jaws are normally held open by a compression spring. Spring loading of the lever link permits extended quill travel and delays part release until the countersink is clear. The work is located and supported by the vertical pin between the jaws. A similar fixture holds the tube for reaming. Production on this two-spindle setup averages 900 pieces per hour



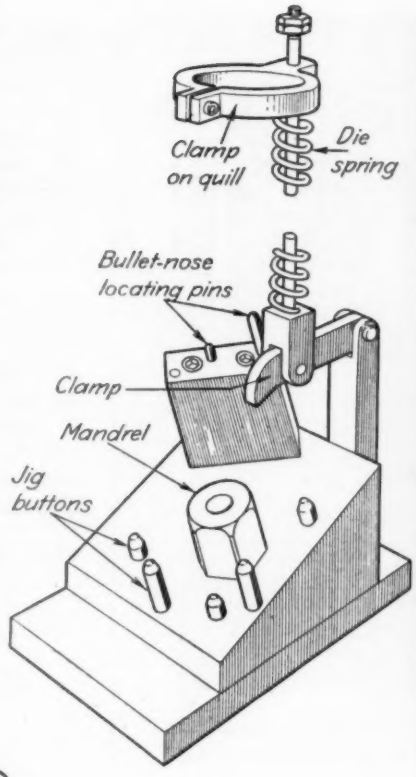
SLIDE-IN-TYPE—Hardened-steel guide rails *A* and *B* support the die-cast air-horn body above the table, rails *C* provide sidewise location, and stop plates *D* and *E* prevent lifting. Guide rails extend beyond the stop plates for easy insertion of the work. An adjustable stop-screw in back spots the piece at proper depth. Bushing plates or bars can be added if required. One such fixture holds work while four holes are tapped with a multiple-spindle head



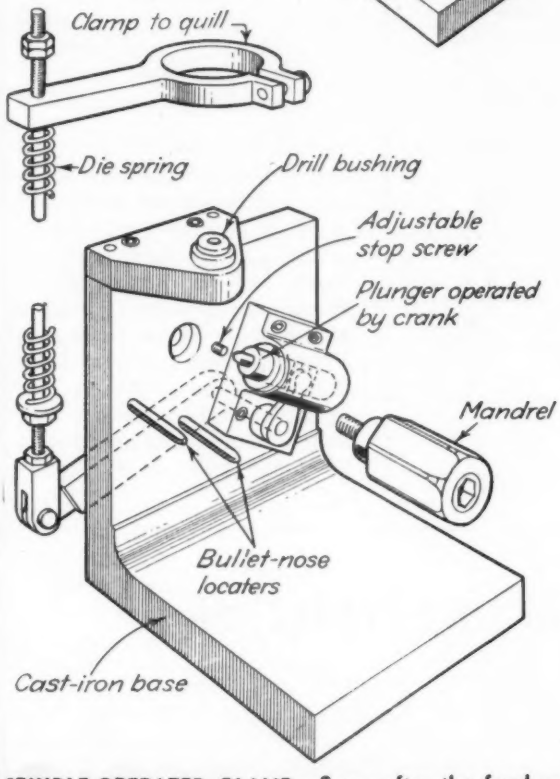
PNEUMATIC JIG—Typical of the application of an air valve and cylinder to synchronize operation of clamp and drill spindle, this jig holds a brass throttle shaft for a carburetor while a hole is drilled at a specified angle with a flat milled on the shaft. A bracket clamped to the spindle quill controls movements of the clamp arm through a c.r.s. bar with 10° slope to actuate the button of an air valve on a bracket extending from the machine column. Clamping pressure is applied only while the button is depressed



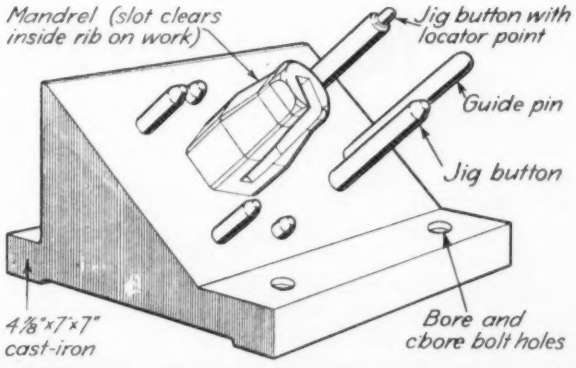
DUAL-PURPOSE UNIT—To drill two different 5/16 in. holes at 27° and 32° angles in different air-horn body castings, this fixture has one locating pin for each piece. The clamp arm is a class 3 lever with the fulcrum pin supported from a bracket on the fixture body and the clamp actuated through a heavy die spring on the spindle quill. Angular relation of mandrel and locating pin to the drill is not enough to prevent work lift, so a mechanical clamp is provided. Jig buttons support the piece at proper height, while locating pins spot it. Again the fixture is open, for easy removal



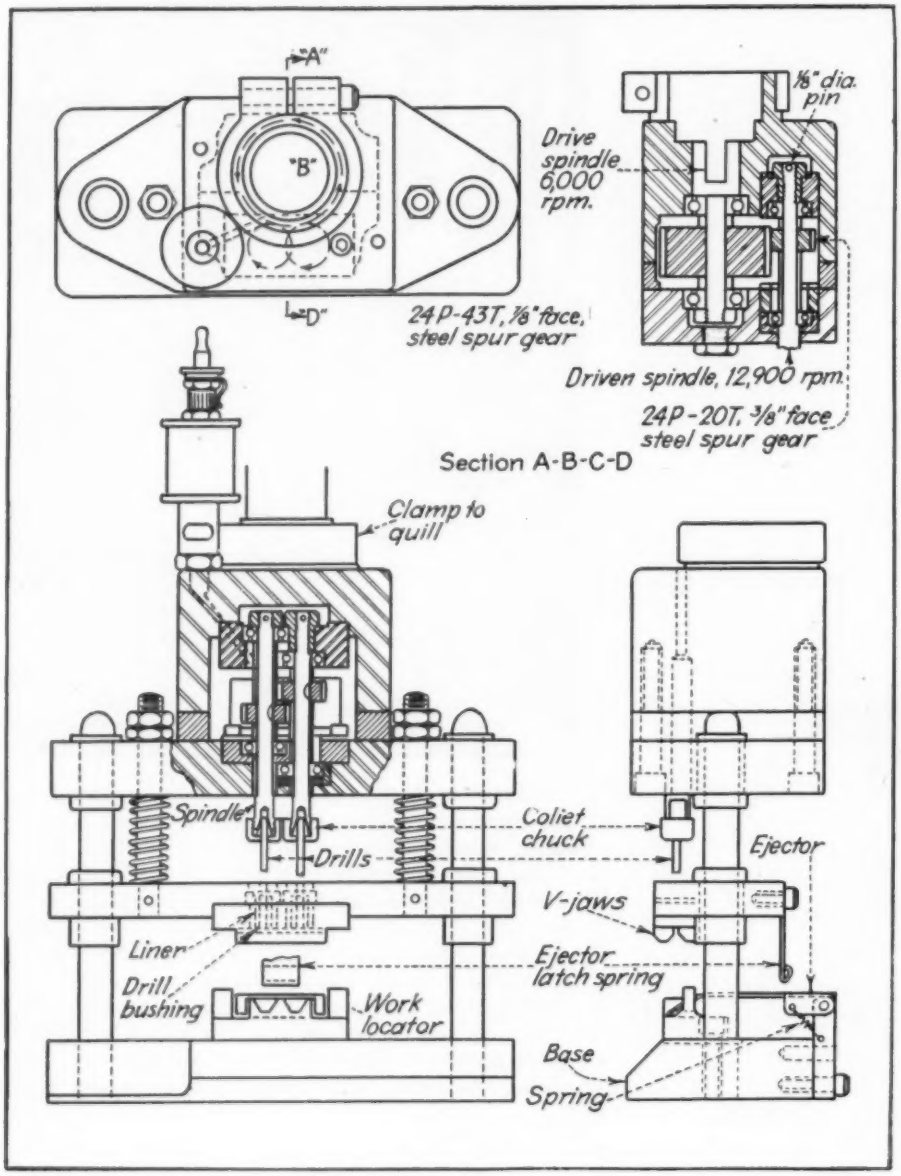
AUTOMATIC FEED— Where two or more operations are performed on larger parts with automatic spindle feeds, operations are usually grouped. Here brass heads for a percussion fuze are rough-drilled, counterbored with a 4-step drill, then finish-reamed on a 3-spindle drill. Pneumatic vises at each station are actuated automatically by bar cams supported from brackets on spindle quills. Brackets on the first and third spindles also carry jig plates suspended from long rods and spring-loaded to clamp while holding guide bushings. The center fixture requires no guide plate. Production rate is about 900 pieces per hour



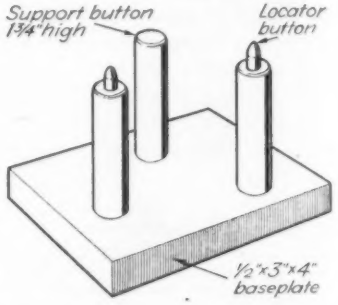
SPINDLE-OPERATED CLAMP—Soon after the feed cycle is started, spring-loaded clamps operated by spindle motion grip the part, holding it until the tool is well clear on the return stroke. An 0.209-in. idle-adjustment screw hole is drilled at 30° in the body flange of a carburetor casting. The work is held on a hex mandrel, with bullet-nose locator pins and an adjustable stop screw providing primary location. Final, accurate location is made by the taper-nosed pin on the end of the clamping plunger, which enters a drilled hole. This pin is 0.005 in. undersize at the tip and 0.015 in. oversize at the base. Automatic feed, clamp operation and return permit the operator to handle several spindles, and the open face makes loading and unloading easy



TILTED FIXTURE—One of 15 used in a die-cast air-horn body line, this fixture holds the work at a 45° angle while a 1.65-mm. hole is drilled in the main vent passage. The part is slipped over a hexagonal mandrel cut away to clear an inside rib, and with two diameters to fit. Jig buttons like those at left support the casting at proper height, while a round-nosed guide pin and jig button with locator point provide proper angular location



TWIN HEAD— This special 2-spindle head and jig drills two 0.082 in. holes 11/16 in. apart in a brass throttle shaft. Head gearing increases 6000-r.p.m. spindle speed to 12,900 r.p.m. The spring-loaded jig plate is supported on guide pins from the head by tie bolts. Tolerances on the job are close, so bushings are used. A latch-type ejector removes the piece from the locating jaws as the drill head rises. This unit is usually set up on the right-hand spindle of a 2-spindle press, the left-hand spindle handling deburring without a fixture. Production is 900 finished pieces per hour



LIGHT-DUTY LOCATOR — This light fixture, designed for deburring a metering-rod guide-bowl cover for a carburetor, is typical of many where there is no tendency for the part to lift, or where hand pressure or a spring hold-down is sufficient clamping. Three buttons support work above the baseplate to clear projections. Two buttons have bullet-nosed locator points which fit drilled holes in the casting

Venetians Were Not Blind to Line Production

A RATHER SURPRISING example of line production 665 years ago is included in the great current best-seller, "The Black Rose", by Thomas B. Costain. Anticipating questions from those who might insist it was Kaiser in 1940, not Venetians in 1275, who invented a production line for ships, the author insists in his foreword: "Authentic records show that the urgent needs of the war with Turkey drive the Venetians to the construction of ships in a single day and that, moreover, they had conceived the idea of the assembly line."

As Costain describes it, trained artisans poured into the arsenal at the start of the working day to start a huge bireme (4-master with double bank of oars) for the Western trade. Oak planks for ribs and keel, fir for masts, walnut for rudders, elm for the capstan, nuts and rivets, sail cloth, cordage and leather-wrapped oars—all lay ready along a lagoon. Broad work streets flanked the lagoon, with supply warehouses across the street. At the first station, ribs and hull were assembled; at the next, prefabricated superstructure wood was applied and the *opera-morta* (an outrigger deck) put on; at the third, the *corsia* and cabins at either end were applied; at the last, masts were erected and fittings installed. The bireme was towed to her dock at nightfall, after the Venetian equivalent of a champagne christening. What now, Mr. Kaiser?

You Bet Your Life!

IF YOU HAD $17 million and I had $1, would you bet that I couldn't cross a city street? Of course not—the odds are too great. But you make that bet every time you take a chance to save one minute of the 17 million minutes the average man of 35 has yet to live. When you gamble on safety in a metalworking plant and take that minute-saving chance, Brother, *you bet your life!*

Harnessing the Electron

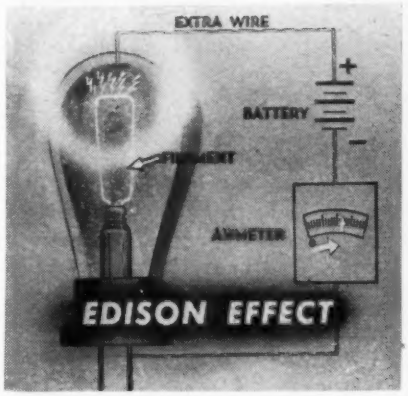
ELECTRONICS is electricity freed from the bondage of wires. Lightning, for example, is electronics on a colossal scale. Or, going to the other extreme, the high-tension current jumping the gap of a spark plug in your car is another demonstration of electronics at work.

In practical electronics the flow of current takes place in sealed glass or metal inclosures called "electronic tubes."

Back about 1882, in one of his incandescent lamp experiments, Thomas Edison sealed a small extra wire, separate from the regular filament, inside a glass lamp bulb and hooked up this extra wire in a circuit with a battery and an ammeter. When the lamp was lighted and the filament glowed, Edison noticed that current, as indicated by the ammeter, flowed through this wire even though it was not connected with the filament itself. There had been a flow of electricity across the space between the extra wire and the filament. This discovery, called the "Edison effect," demonstrated the underlying principle of every electronic tube in use today.

Electron Theory of Matter

All matter is composed of one or more of 92 elements, such as: oxygen, hydrogen, copper, mercury, aluminum, and so on. Each element in turn is composed of its own special kind of particles — called atoms. These particles are so small that they cannot be seen, even with the most powerful microscope.

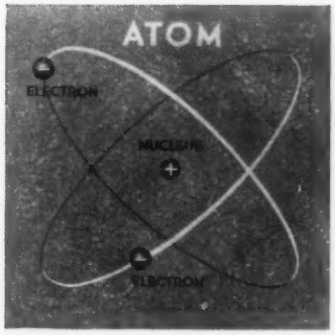


Edison noted that current bridged a gap inside an electric lamp

Each atom, in turn, is a miniature solar system in itself, containing in its center a positively charged sun which we call the nucleus. Around the sun revolve one or more negatively charged planets called electrons, held in their orbits by their attraction to the positive nucleus.

The number of electrons in an atom varies with different elements. For example, the hydrogen atom has one electron; helium has two; oxygen, eight; while uranium, with its 92 electrons, has the most. However, electrons in any one element are identical to and interchangeable with those in any other element. In fact, the electron itself is our smallest subdivision of electricity.

We can classify these electrons into "core" electrons which are found in the orbits nearest the nucleus, and are therefore more tightly bound to it, and "outer" electrons,

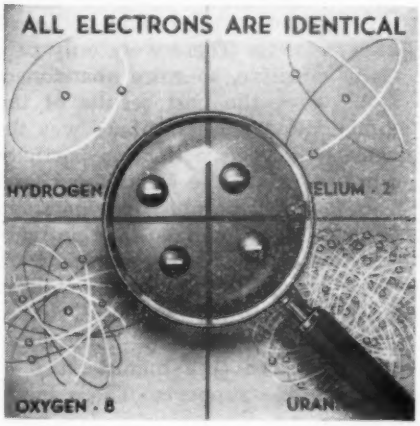


Atoms are miniature solar systems; each has a nucleus around which electrons revolve

those electrons in the outer orbits which are less tightly held.

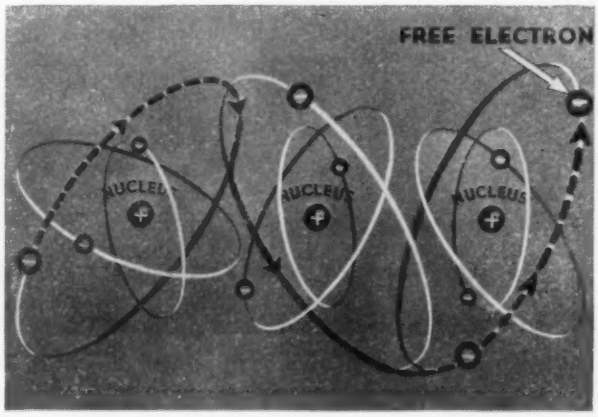
In certain metals, such as copper, the nuclei are spaced close together so that their outer electron orbits overlap. This permits an outer electron of one nucleus to replace one of the electrons in the outer orbit of an adjacent nucleus. In the act of changing from the orbit of one nucleus to the orbit of another nucleus, these outer electrons become "free" electrons. Under normal conditions each nucleus, because of its definite positive charge, will always attract the correct average number of electrons although the free outer electrons may interchange many times. The intricate motion of the free electrons has been pictured by some scientists as an electronic gas of speeding electrons filling the space between the orderly spaced nuclear cores. It is the free electrons that we are most concerned with in practical electricity and electronics. This is the electron we harness to do our work.

Based on a sound slidefilm in the General Electric industrial electronics course.

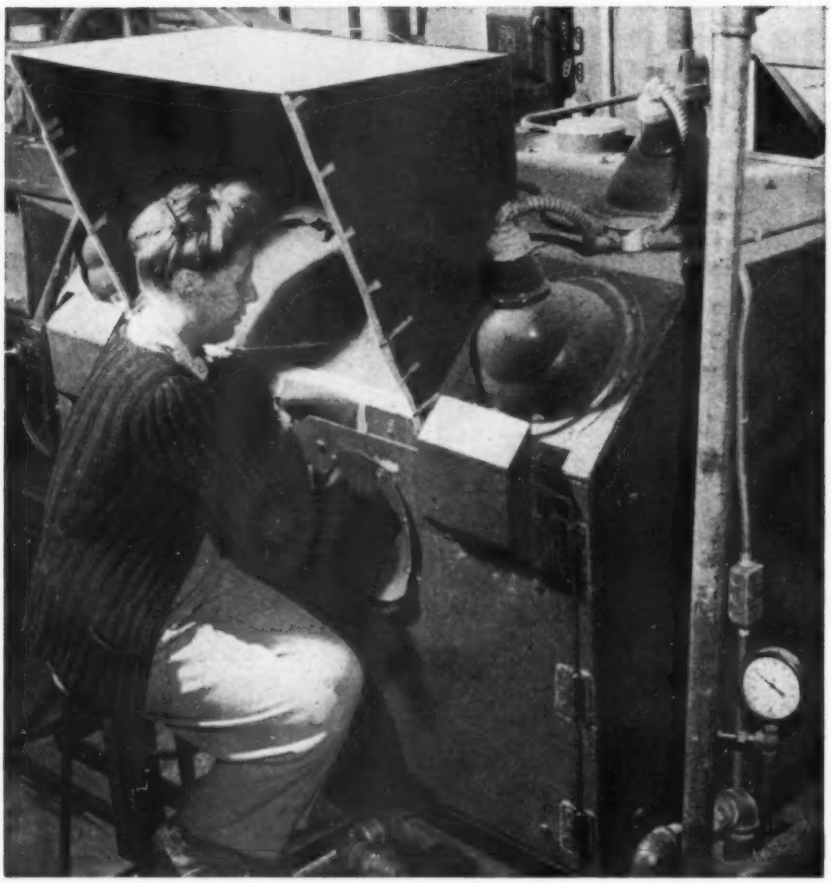


← **Elements** are distinguished by different numbers of electrons in their atomic structure

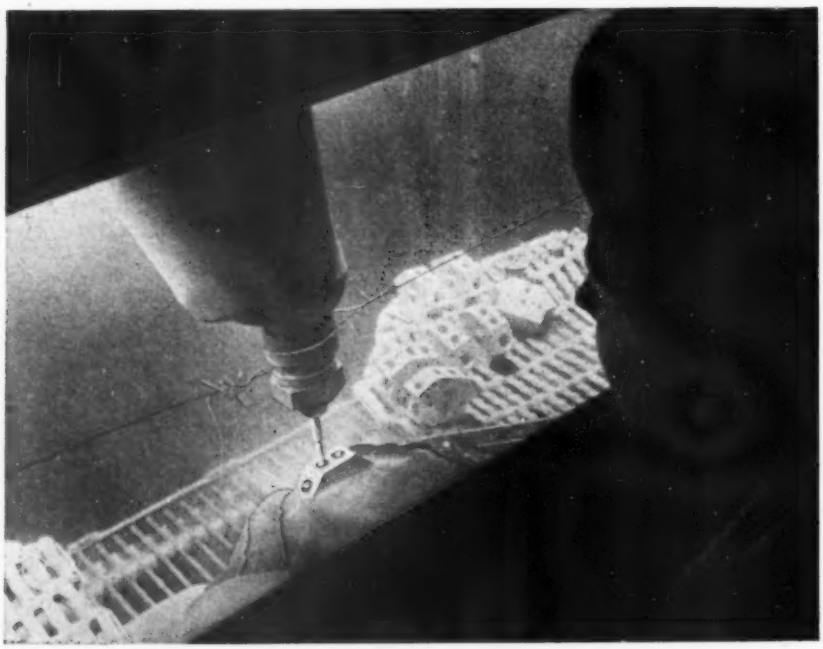
Free electrons,→ as distinguished from core electrons, may transfer from one atom to another



Burrs Blasted by Shell



This special blasting machine handles lightweight particles such as clover seeds or walnut-shell flour to clean up precision light-alloy hydraulic parts



Burrs, chips and sharp edges are removed from inside a hydraulic-valve body by shell-flour blasting

THE PROBLEM: to deburr precise and fragile hydraulic parts for aircraft at top speed, without damage. The solution was nuts! Now the inside try-by-try story

BY WILLIAM L. LEWIS
AERONAUTICAL ENGINEER

EVEN THE MOST minute burr must be removed from every part of precision hydraulic equipment, especially where there is any possibility it may get into the fluid stream. It may become lodged under a valve poppet seat, come in contact with a synthetic seal or scratch the highly finished surface of a honed sealing area. This was the justification for the former costly procedure of burr removal by hand. At best it is slow, painstaking work requiring time and specially developed skill to avoid scrapping expensive parts.

Greatly stepped-up demands for hydraulic equipment during the war forced revisions in production methods. Some way had to be found to do the work more rapidly yet be equally reliable.

First Attempt

Many methods and devices were tried. Among them were high-pressure air and various liquids forced through the ports of valve bodies at high velocity. These were only partially effective, so were abandoned.

Air gave the best results of the fluids. However, air alone was inconsistent in its action, so particles were added to the airstream. Sand was found to be much too harsh in its action on metals of relatively low density. Lighter materials were tried, among them synthetic-rubber punchings and a synthetic rubber and cork composition—both waste products from the manufacture of aircraft line supports. These mate-

rials, while light enough and easily available, were unsatisfactory because of the tendency for the resilient material to bounce off the metal surfaces and to swirl around in a confused stream.

It was apparent that a light abrasive material was required and that a machine designed for sandblasting was unsuitable for the lighter abrasives. To use a light material successfully, pressure rather than suction was needed to feed the abrasive into the hose and nozzle. The special machine which proved satisfactory for work of this kind has a tank for containing the abrasive into which air is forced at 60 to 75 p.s.i. pressure. The tank air inlet is valved to close against internal backpressure, so the abrasive is forced out of the tank through the connection to the hose and into the directing nozzle. When tried in a suction-type machine, the light materials clogged the hose, preventing the essential smooth, even flow of abrasive particles.

Clover and sesame seeds had desirable abrasive qualities, so were used for some time until trouble of an unexpected nature developed. Internally threaded valve bodies came to final assembly with tight threads, so tight they had to be retapped before they could receive line fittings or valve caps. No one attributed the change to the blasting process until all the other causes were examined and eliminated.

Clover Coats Threads

Finally, a careful, microscopic examination of threads showed a barely discernible sticky coating, ultimately found to be a deposit from the seeds. Further examination of the seeds under powerful microscopes revealed that inside the hard outer shell is a substance apparently similar to slightly moist wheat flour which is released when the seed strikes and bursts against a sharp edge, such as a thread, and later hardens and dries to form a cement-like coating. This hardening action is probably furthered by the anodic process in which parts are subjected to water and heat.

Bone flour was used for a while, but proved too expensive and a little too harsh. Ground apricot shells and ground olive pits were also tried, but both were much too hard and too sharp for the aluminum alloys to withstand.

Finally, walnut-shell flour was tried and found satisfactory. This material may be had in various grades, as it is manufactured for a variety of commercial applications and is readily obtainable. It is obtained in grades of 20 to 40 mesh and used over and over until it reaches the consistency of airborne dust, when it is carried off by dust collectors integral with the machine. Incidentally, efficient collectors are absolutely essential to avoid serious dust explosions. The dust byproduct is collected and sold for use as a filler for plastics, a fertilizing mulch for sandy soil or as a principal ingredient of wood filler and plastic wood. The main body of the ground shell may be used again and again until it acquires a dark color indicating too many metal chips.

Walnut-shell flour greatly reduced production costs and increased the volume output of vital parts. Hand work was practically eliminated, except for removal of some burrs so large and so firmly lodged within valve bodies that they had to be removed by hand.

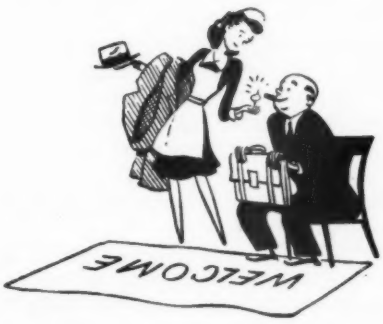
TALKING SHOP

Swiss Misses

AMONG NOTES from our first-since-the war editor into Switzerland: Stocks of ferroalloys are so low they're kept in vaults and rationed. . . . No forging capacity is available, so Pelton wheels, turbine rotors, locomotive wheels, etc., must be cast. On large castings an arc is drawn to the gate to aid flow in pouring.

Foxy Foxboro

ANOTHER OF THOSE intriguing "Welcome" folders comes to us, this time from the Foxboro Company, Foxboro, Mass. A 4x5-in. folder opening to 8x10, it explains the system of announcing callers, offers washup, lunch and auto-service facilities, gives a road map and condensed train schedule, lists town features and company products, then obligingly gives correct names and titles of officers and key personnel—even offers other names if the caller isn't sure. A far cry, this, from the days of "Callers interviewed by appointment only, Tuesdays at 9:30 to 10:00 o'clock." Can it be that the Golden Rule is at last being accepted in business?



Smelly Business

FISH AND LARD CUTTING oils spilled on a watch-factory floor produced such a stench workers were nauseated. Trouble was averted by installing in the ventilating system an evaporator carrying an even-stronger—but pleasant—odor. The overpowering odor, called "Airkem," contains over 125 vegetable substances, of which chlorophyll is dominant.

Help Mates

DURING THE WAR, apostles of calamity viewed with alarm the number of women taking over—and really enjoying — men's jobs. Women disrupted routine, would increase unemployment, were stepping out of their accepted place. But romance and the lure of the kitchen got in their licks and the problem evaporated. Now comes Maytag Co., washing-machine maker of Newton, Ia., with a doleful tale. The 900 women who worked there during the war were "released" when war contracts ended and the company planned to reassume its plant policy of employing men only. But Iowa has an unemployment compensation act that pays $18 a week for 18 weeks. Men from other war plants take that in preference to a job—one recruiter reported 102 such men in one day. So Maytag has been forced to rehire women, now has 180.

Pointers on Abrasive Points

BY WILLIAM S. HALLOWELL AND WILLIAM S. HEMSLEY, ABRASIVE COMPANY

Close analysis of the job and careful selection of wheels and points guarantee efficient and economical grinding operations

MODERN PORTABLE GRINDERS have rotary speeds high enough to drive even the smallest mounted abrasive wheels and points at efficient surface speeds. These higher operating speeds, some of them over 100,000 r.p.m., enable the wheels and points to remove material faster and at the same time last longer in service.

Three factors contribute vitally to satisfactory and economical use of mounted wheels and points: a knowledge of the possibilities and applications; a clear understanding of the limitations; and selection of a specific wheel for a specific job, a choice influenced by operating conditions, job requirements and tool characteristics.

Fields of application, exclusive of precision internal grinding, are:

1. Finishing molds, dies and metal patterns.
2. Tool grinding.
3. Snagging and finishing comparatively inaccessible spots such as the webs and spokes of gears and pulleys.
4. Finishing welds.
5. Deburring the edges of gear teeth, holes, slots and sheets.
6. Such miscellaneous jobs as blending, burnishing, chamfering, drilling, engraving and marking, enlarging, grooving, nicking, inlaying, mortising, polishing, routing, and scoring.
7. Preliminary grinding of connecting rods and other high-speed components of aircraft and automotive engines to remove the minute checks, cracks and tool marks which might be the starting points of fatigue failures. Final finish calls for rubber or fiber wheels.

In considering the limitations of mounted wheels and points, relative to these applications, a number of conditions indicate there might be a choice between two or more types of tools. For extremely hard materials or scale, abrasive points or wheels have a distinct advantage. On an irregular or wavy surface, the choice depends on the result to be achieved. If it is desirable to retain the irregularities in the finished surface, the finishing should be done with a rubber or fiber wheel which, because it is flexible, will follow the irregularities. If irregularities are undesirable, the material should be removed with a mounted wheel or point and the finishing done with a flexible wheel or a fine-grit mounted wheel to remove grinding marks.

Rotary Files

Where the finish need not be of especially high quality, rotary files are usually the best choice on either ferrous or non-ferrous materials which are not too hard for them. If a high finish is required, the file will be followed with a touching-up operation with a mounted wheel or point, or some other form of abrasive. Breaking the edges of aluminum or cold-rolled sheets can be done with either rotary files or mounted wheels. Files are usually preferred for aluminum sheets because the material is so soft that it will not dull the file, but may fill or load a mounted wheel.

Even on jobs to which mounted wheels and points are well suited, unsatisfactory performance may result if errors are made in selecting the wheel for the job. It is important that the wheel be of the right shape and of the correct specifications as to type of abrasive, grit size, type of bond and grade. Operating conditions must also be correct as to wheel speed and pressure. The 84 standard *A* and *B* and the 98 other *W* shapes of mounted wheels and points provide a variety designed to handle any grinding job. Despite this, poor performance is quite often the result of choosing the wrong shape.

An example of this is the common job of chamfering the edge of an oil hole. The round points, numbers B121, 122, 123, 124 and 125 are designed for just such a job and will give good production and efficiency. Quite often, however, a tapered point such as A15 or B53 is used. Even a comparatively light pressure against the sharp edges of the hole will groove the point to such an extent that it quickly becomes unusable and throws up a counter burr.

A frequent and expensive mistake is to alter the shape of a wheel or point by dressing it, when a standard shape would do the job as well or better. A job which involved breaking the edges of small gear teeth, flame-hardened to 60-64 Rockwell, gave a good instance of this error. The correct wheel was a plain-mounted W144 in vitrified bond. The operator thought he should use a B104 point, one that did not happen to be in stock at the moment. He took what he thought was the next best, a resinoid B122 and dressed it to a B104. He ended up with a mounted point costing three times the price of a W144 vitrified, which would have done a better job.

Another case: The job was to grind a blind hole, forming a sharp corner where the bottom face and side joined. The operator chose a straight W237 wheel. The pressure applied in the effort to get a square bottom corner not only produced a bell-mouth hole but ruined the wheel. An A31 point with countersunk end, designed especially for such a job, should have been used.

Wheel Specifications

Specifications for mounted wheels and points are governed by much the same considerations as those for regular wheels. Thus, for grinding cast iron, non-ferrous metals, glass, all plastics and the cemented carbides, the abrasive to use is silicon carbide. Special friable aluminum oxide is indicated for material removal on all steels including the nitrided steels used for dies and stainless steel. Regular aluminum oxide in a hard bond is best for breaking corners, burring, chamfering and so on.

The usual grit sizes are 36, 60, 90, 120 and 150, depending on the desired finish and speed of material

removal. The shape of the point sometimes affects the required grit size, because a fine-grit wheel will hold its shape better than one of coarser grit. For general shop work, including touching up tools and dies, 60 or 90 grit will cover most needs.

In most shops vitrified bond can be used for practically all work. Resin-bonded mounted wheels and points are used mostly for special applications, as in the larger sizes for snagging non-ferrous metals and stainless steel at high speeds. The standard grades for mounted wheels and points are N, O, and Q—which will cover virtually all jobs.

It has already been stated that increased speeds improve the efficiency of mounted wheels and points in rate of material removal and wheel life. On a mass-production job of removing burrs from the holes, slots and grooves of many thousands of parts, the shop was getting a life of only 25 pieces per wheel. Investigation showed that the wheel was operating at the low speed of 22,000 r.p.m. as the first step in correcting the situation, a high-speed machine was substituted. At 75,000 r.p.m., the production of the wheel rose to 75 pieces. Finally the full speed of the machine, 105,000 r.p.m., was utilized and the life of the wheel increased still further to 115 pieces.

Critical Speeds

The correct speed to use depends upon these seven factors:

Safety—Most important, of course, is safety. Mounted wheels and points may fail either by breakage of the wheel itself from centrifugal force, or from failure of the spindle by breaking, or more often by bending at right angles.

To determine the safe top limits of speed for all shapes and sizes of mounted wheels and points, the Grinding Wheel Manufacturers Association assigned the problem to its Safety Committee for exhaustive study. The findings have been presented in detail, with complete tables of allowable speeds in a booklet which can be secured from the Association at 27 Elm St., Worcester 8, Mass., or from wheel manufacturers. This booklet should be consulted by every user of mounted wheels and points before determining the speed to use on any job. In addition, it is well to keep clearly in mind the following general rules.

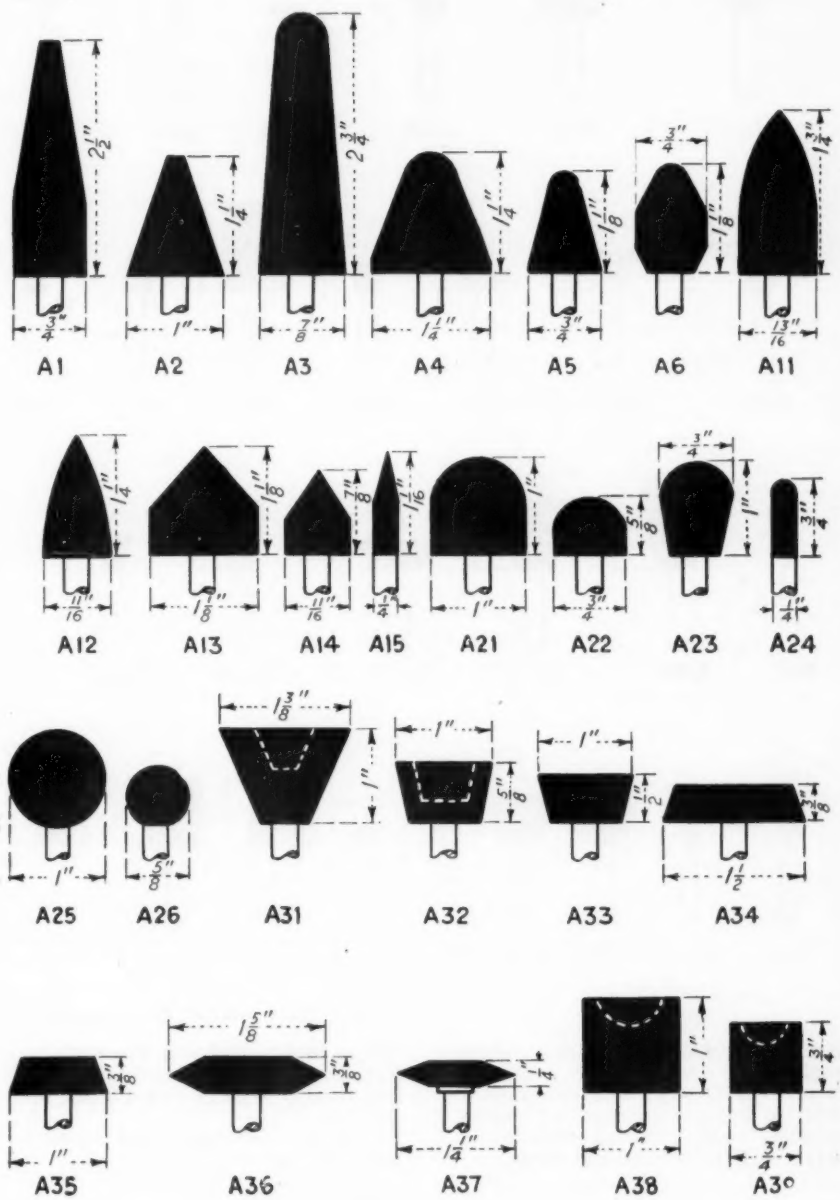
The "critical" speed is that at which failure of the spindle is likely to occur. Every spindle with a wheel or point mounted upon it has a critical speed at which vibration due to deflection or whip tends to become excessive. The critical speed varies with:

1. Dimensions of the wheel. Increasing the size of the wheel in either diameter or thickness will lower the critical speed, and vice versa.

2. Diameter of the spindle. Increasing the diameter of the spindle will raise the critical speed, and a smaller diameter will reduce it.

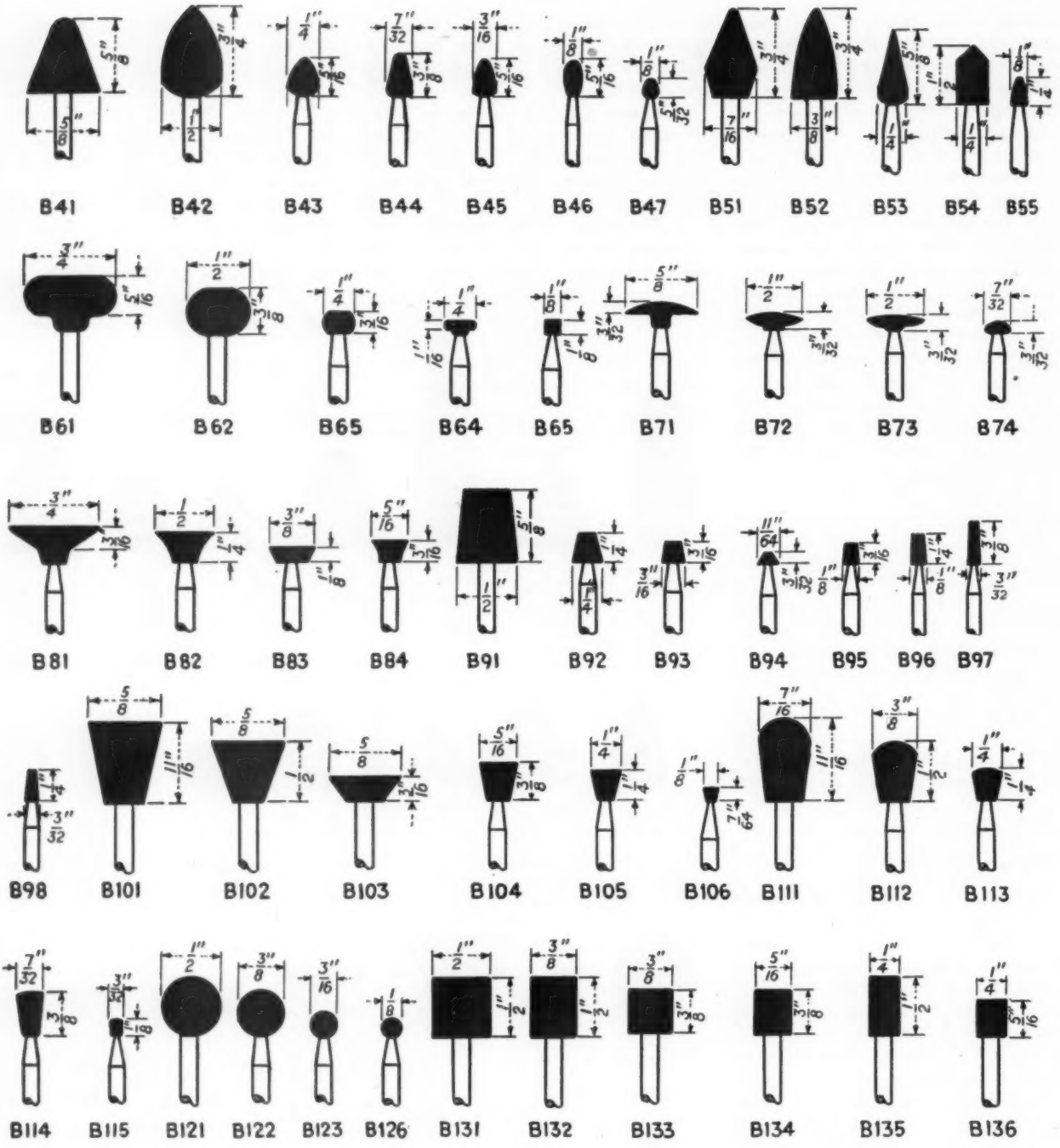
3. Increasing the overhang, that is, the distance from the end of support to the base of the wheel, will lower the critical speed. Reducing the overhang by pushing the spindle back into the chuck will raise the critical speed.

Even if the critical speeds, as recommended by the Grinding Wheel Manufacturers Association, are observed, spindle failure or



TYPICAL APPLICATIONS

A1, A2, A3 —cleaning castings and other large, heavy work.
A2, A4, A5, A6, A12 —stock removal from large work, dies, taper holes.
A13, A14 —truing and finishing chamfered oil holes, dies, etc.
A15 —grinding very small holes or corners, holding and sharpening the point like a pencil.
A21, A22, A23, A24, A25, A26 —chamfering and burring holes, cleaning holes in dies, forming and finishing radii.
A31, A32, A38, A39 —cleaning blind-end holes. The counter-sunk end prevents the formation of a "dead-end" surface design.
A33, A34, A35 —cleaning out sharp angles.
A36 A37 —slotting and nicking.

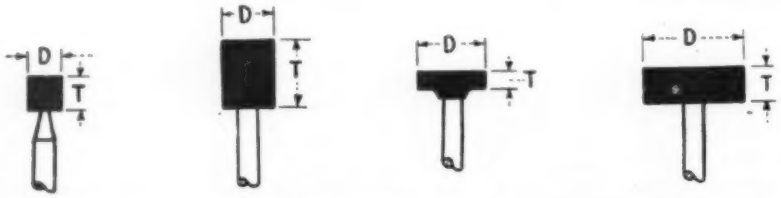


TYPICAL APPLICATIONS

B103 to B106 —tapers and sharp angles.
B111 to B115 —grooves and radii.
B121 to B124 —burring oil holes, grinding radii, polishing surfaces.
B131 to B136 —blind-end holes.

B41 to B55 —tool and die work.
B51, B52 —internal form grinding.
B61 to B65 —grinding radii and grooves.
B71 to B74 —nicking and slotting, gear burring.

B81 to B84 —nicking, slotting, cleaning angles and blind end holes.
B91 to B98 —hard-to-reach spots where end of wheel must be relieved.
B101, B102 —blind-end holes and sharp angles.



In general, the W shapes of wheels have much the same uses as the A and B shapes. They can be dressed to any required form. The larger W shapes are more versatile than the A and B shapes when a larger wheel is required. They are also used for internal grinding.

wheel breakage may result if there is considerable run-out because of a worn chuck or bearings, or careless mounting.

Finish—The speed will govern to a considerable extent the finish secured. In general, the finish is improved by increasing the speed. However, for each shape, size and grade of mounted wheel there is a point at which the wheel will act so hard that it does not have a good cutting action. It burnishes the work instead of cutting.

Speed as a Remedy

Grade—The grit and grade of the wheel are closely related to the speed. If burnishing occurs, it can be corrected by decreasing the speed to make the wheel act softer, or if it is desirable to retain the high speed, a better cutting action will be secured by using a softer wheel or coarser grit, or both. A wheel which is actually too soft, or acts too soft, will break down too rapidly, groove, and impair the finish. The best remedy is to increase the speed if possible, while keeping within safe limits. If speed cannot be increased, a harder or finer grit wheel should be used.

Material—The nature of the material being ground influences the speed required. In general, the speed should increase as nearly as possible in direct ratio to the hardness of the material being ground, grit and grade of the wheel remaining constant.

Wheel Contact—The area of contact between wheel and work influences the speed required. As in any kind of grinding, the less the area of contact the softer the action of the wheel. Therefore, if the area of contact is small, a higher speed should be used to get harder action. It is often desirable to change the speed in the course of a job. Thus, if both the edge and the bottom of a blind hole are to be ground it may be advisable to use a higher speed on the edge, because of the much smaller area of contact. This would be done chiefly to reduce wheel wear.

Long Wheel Life

If the chief consideration is to get long wheel life, it is evident that higher speeds should be used. However, this can be overdone. The ideal speed is that which gives the best all-round results, considering wheel life, finish and material removal. It seldom pays to secure long wheel life at the expense of good cutting action.

It is easy to determine definitely whether the cutting action is what it should be. Stop the wheel after a few moments operation. If it is dusty and unevenly worn, it is either too soft or is acting too soft because of too low speed. If possible, increase the speed. If that cannot be done, use a harder wheel. If, on the other hand, the wheel shows a slight sheen, but is not loaded, the speed and grade of the wheel are about right and the best combination of cutting action and wheel life is being secured.

Speed Range—Often it is impossible to secure the right cutting action and wheel life because the machine's speed is limited. Every shop should therefore have several machines of different speeds to choose from—or at least one variable-speed machine.

Estimating Pressure

Pressure is an important factor in the correct use of mounted wheels and points. Unfortunately, pressure cannot be accurately nor readily measured while the wheel is in operation, so the operator must learn by experience. Ordinarily, an experienced operator can tell if a wheel is free-cutting. If it causes burning, excessive pressure is probably being applied. If the machine speed is safely below the critical speed of the wheel and if the wheel runs smoothly when free, but not so smoothly when under load, it is likely that excessive pressure is being applied.

It is well to remember that heavy pressure does not increase material removal as is commonly believed. Severe pressure is likely to slow the machine to a point where chatter results.

Use light pressure up to the point at which the wheel loses contact with the work. Better finish and faster production will repay care in watching the pressure.

Short Cut for Checking Pitch Diameter

BY JACOB DE MARCO

IN CHECKING the pitch diameter of threads by means of the three-wire system the formulas generally used are:

$M = E + 3G - 0.866p$ and $M = D - 1.5155p + 3G$

where M = measurement over wires
E = pitch diameter
G = diameter of wires
D = major diameter
p = pitch

Much time spent in calculations and handbook reference can be saved in checking the pitch diameter of a thread in the 8-pitch series by merely adding 0.027 in. to the nominal major diameter of the thread, providing that the "best" wire 0.07217 in. is used. For example:

Find the measurement over the wires for a 1¼-8*N* thread. Using the aforementioned formula,

$$\begin{aligned} M &= 1.1688 + (3 \times 0.07217) \\ &\quad -(0.866 \times \tfrac{1}{8}) \\ &= 1.1688 + 0.2165 - 0.1082 \\ &= 1.2771 \end{aligned}$$

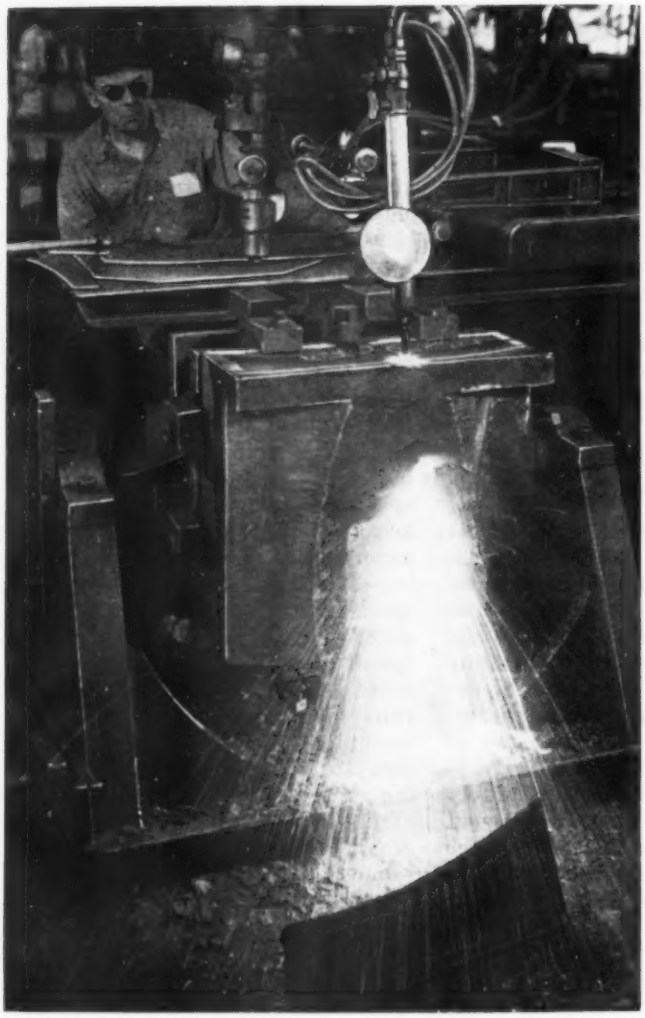
Using the short-cut formula,

$$\begin{aligned} M &= 1.250 + 0.027 \\ &= 1.277 \end{aligned}$$

This formula can also be used for threads in the American National 12 and 16-pitch series by using different constants and wires. For the 12-pitch series add 0.018 in. to the nominal major diameter and use wires 0.0481 in. in diameter. For threads in the 16-pitch series add 0.0135 in. and use wires 0.03608 in. in diameter. The formula cannot be used for checking pipe or V threads.

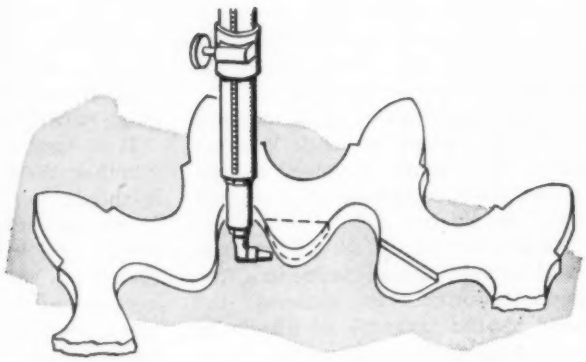
CORRECTION NOTICE

In publishing the article, "Factors Simplify Odd-Toothed Gear Measurements," in a recent issue of AMERICAN MACHINIST, the name of the author was inadvertently omitted. The article was an original piece of engineering work by Sidney Cornell, Gear Engineer, Pratt & Whitney Aircraft Division of the United Aircraft Corporation.



This shows the third step in the flame shaping of an ordnance part. The first two cuts were the curved bevels at each side. Piece is held in a rotating fixture so that four shaping cuts can be made in sequence. Tolerances are held close

Torches Pinch-Hit in Machining Operations



Flame cutting performs a machine-tool operation in notching inside lugs on tank sprockets. Torch was moved in horizontally by machine, stopped automatically, and raised by manual racking to complete the recess cut. Thirteen lugs were notched in 8 minutes

Examples of how flame cutting can be used on jobs other than profile cutting of flat plates are presented in this twelfth article in a continuing series

By DR. G. V. SLOTTMAN
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REDUCED TO THEIR ESSENTIALS, all of the many techniques of flame cutting and shaping are founded on the simple principle of controlled oxidation of steel. In practice this means that steel can be cut or eroded to any shape or form desired merely by heating a spot to ignition temperature and blowing oxygen in the right direction. Accordingly, it is not surprising to find users of the process applying it in many unconventional ways. Some of these applications are unconventional only because of the infrequency of their use, while others are truly inventive adaptations.

Among the improvisations in oxyacetylene cutting are those in which torches are used to pinch-hit for machine tools, particularly in small shops where certain tools are not available. Often, however, it is not necessity but simple economy which dictates the substitution. The 90° torch adapter, for example, was devised to cut right-angle recesses on inside sprocket lugs. Previously the milling of these recesses required 45 min. per sprocket, and machining was a bottleneck. The torch performed a rough machining operation in 8 min. per sprocket, leaving only finish metal to be removed. Final milling then took only 20 min. and production was actually doubled.

Another metal fabricator, having the problem of shaping the ends of tubes to fit into welded joints, cut the end profiles using a sleeve templet. The templet was shaped to the profile required, slipped over the tube to be cut, and crabbed against a fixed torch tip while rotated at proper cutting speed. A similar but more precise method has been used in the flame cutting of barrel cams. Again, multiple-torch cutting has been used to convert wide slabs into square billets to fill an urgent need. Similarly it is a fairly frequent practice to trim off the flanges of

I-beams or channels to convert them into tees or angles when such are needed.

It will be seen from the foregoing few examples that flame cutting lends itself to a wide variety of departures from the familiar profile cutting of parts from flat steel plate.

Another departure from standard practice is the cutting of previously profiled parts in a second and even a third plane. This involves nothing new in operating procedure, but it enlarges the scope of cutting, making it a flame-shaping process. In this field it produces parts comparable to forgings or castings.

In multi-plane cutting there may be a problem in mounting the work for making the second cut, in cases where the first cut leaves nothing but rounded or irregular surfaces for the piece to rest on. A simple method of supporting the pieces is to set them on the upturned scrap left from the first cut. The piece naturally mates perfectly with the scrap, which thus provides a secure foundation. For multiple cutting, several such scrap pieces can be uniformly spaced on the cutting table, serving as jigs for the individual pieces during the second shaping cut.

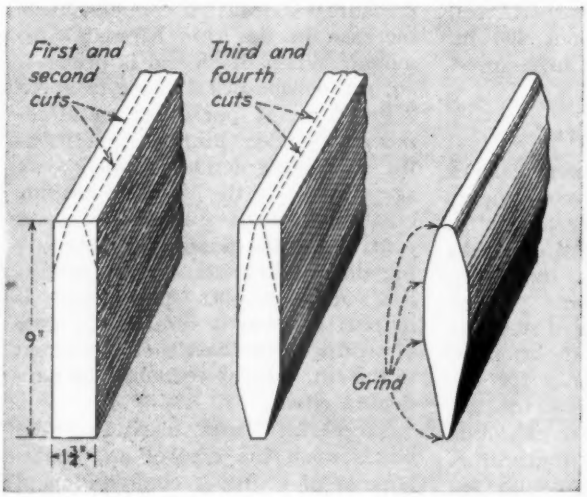
Bevel cutting is a standard variation of oxyacetylene cutting, performed usually on plate edges as preparation for welding. Single or double bevels, with or without land between, are cut with one to three torches mounted on a Radiagraph. Tip size and pressure adjustment in each tip are determined by the actual depth of each cut, rather than by plate thickness. Another factor is that the closed bevel cut by the leading torch is always cut with a large tip and the land and open bevel with smaller tips, since these are cut with the trailing torches which have the benefit of accumulated heat in the plate. The positioning of torches in multiple beveling should always be such that through cuts are made in the scrap. Otherwise the slag and oxygen from the second or third torch will wash away and destroy the contour of the open bevel or land.

In the oxygen lance process, a small-diameter iron pipe is used as a torch for boring holes to any depth. The pipe is connected directly to the oxygen hose, thence to the oxygen regulator and cylinder. In practice a small area on the surface to be lanced is preheated with a welding or cutting torch, and the oxygen from the lance is directed at this spot. Immediately oxidation of both the base metal and the end of the lance begins. As the hole penetrates deeper, the end of the lance is progressively consumed since it is kept close to the bottom of the hole, where fresh oxygen is needed. A rotative manipulation of the lance, or crowding against the bottom of the hole, will enlarge the hole and reduce speed of penetration. The best technique is to allow the lance to float in the hole, moving forward at an even rate. The following table lists approximate diameters of holes obtained with various diameters of lance pipe:

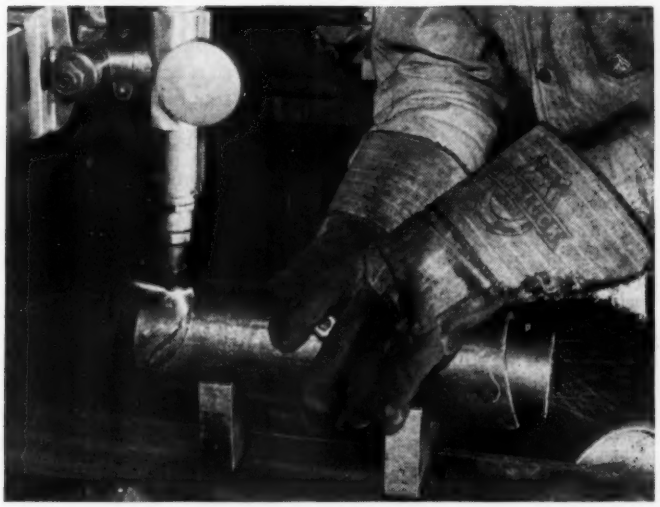
Pipe Diameter, In.	Hole Diameter, In
⅛	½ to 1
¼	¾ to 2
⅜	2 to 3
½	3 to 3½

The burn-off rate of the lance can be materially reduced by inserting a small steel rod inside the pipe, to be consumed with the pipe. Lancing

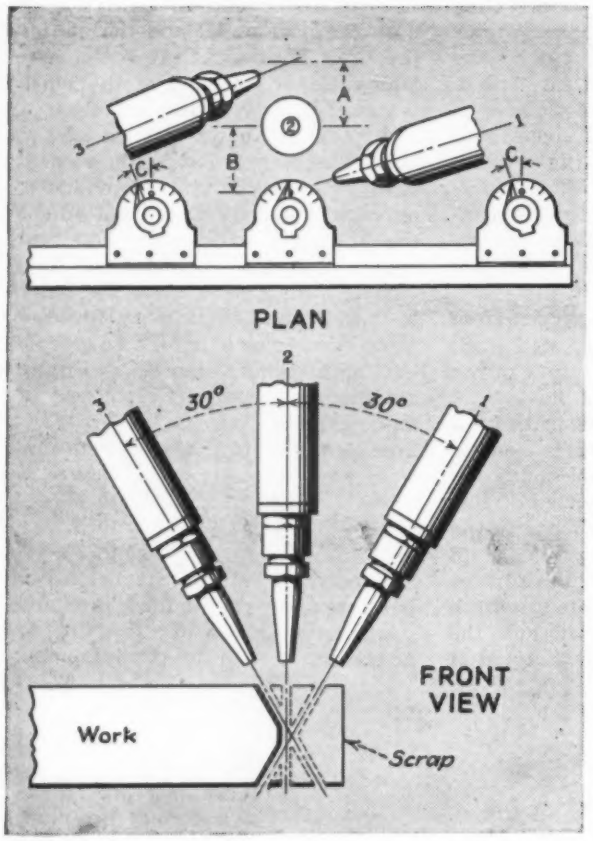
These links are typical examples of two-plane cutting. After cutting the profiles, the pieces are turned 90° for cutting the slot and shoulders. Torch position must be adjusted vertically during travel of torch over curved surface, to keep a constant distance between tip and work



In an emergency, a small manufacturer flame-shaped streamlined struts when machine tools were unavailable by making four deep bevel cuts, then grinding the intersections smooth. Struts support an outside submerged bearing for propeller shafts of small boats

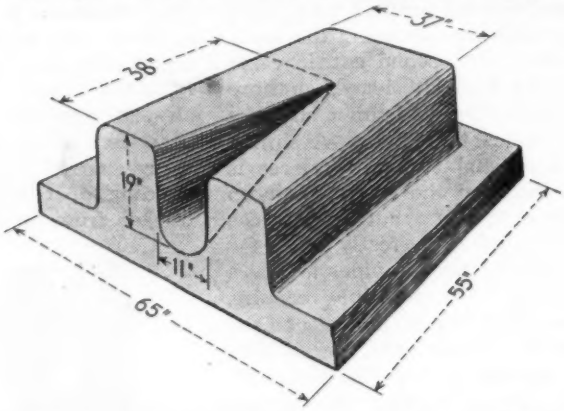


Improvised setup for cutting curved profiles in steel tubes which will be welded at intersecting joints. Outer tube is a sleeve templet, shaped to required contour and held against cutting tip while rotated in dollies. Inside tube is held in place by a bolt. Sleeve protects tip



Schematic arrangement of positions of torches for cutting a double bevel with land

These equalizers offer a good example of cutting in two planes. Shaped entirely by the torch, the only machining done was the drilling of the holes. Multi-plane cutting of such parts is an alternative to forging or casting



Large forging die with tapered recess which was shaped manually with a scarfing torch. Depth control can be held to a tolerance of 1/16 inch

is often used to cut starting holes for machine cutting of heavy plate. Other common uses are the opening of blast furnace tap holes, holes in ladle chills and skulls prior to blasting, and occasionally for putting holes through concrete.

The scarfing torch serves for removing entire surfaces of blooms prior to re-rolling, removing surface defects, and burning off unwanted sections of metal generally. The torch is moved at high rates of speed—from 40 to 60 ft. per min., removing metal at a maximum rate of about 21 lb. per min. or 1300 lb. per hr., which is several times the rate of machine-tool planing of the softer steels.

Flame gouging is used for burning out defective welds, defects in castings, and similar operations. The torch is held at a tangent, thereby gouging a furrow as long as required, and usually ¼ to ¾ in. wide. The depth of gouge is governed by oxygen-jet velocity, gas flow, and angle of incidence, but is usually not more than ½ in. for a single pass of the torch.

Flame turning is another of the basic machining processes. This has been experimented with enough to demonstrate that much can be expected of the process. Any standard lathe can be adapted to flame turning by simply mounting the torch on the toolpost and providing a repository for the hot slag. For simpler types of cut, metal is removed at the rate of between 500 to about 1800 lb. per hr., on low-carbon steel. This compares with about 600 lb. per hr. for cutting with high-speed machine tools.

Flame-Turning is Limited

On the harder, higher carbon steels the ratio becomes even wider, these steels being harder to cut by machine, and increasingly easier to cut by flame machining, indicating the economy of the flame process improves as the hardness of steel increases. Another consideration is that power is needed only for rotating the work, and not for the actual performance of the cut, thus reducing power costs for machining. Generally, flame turning is limited to rough-turning operations, since the precision requirements obtainable by tool machining cannot be met.

Over the range of mechanical flame machining, average oxygen consumption varies for 2 to 6 cu. ft. per lb. of metal removed. For any set of constant conditions as to size of cutting tip, angle of inclination and rate of travel, the oxygen consumption varies almost directly with the volume of metal removed. In other words, an increase in oxygen pressure will cause a commensurate increase in the rate of metal removal. When the metal is preheated, gas consumption drops to about 2 to 2¾ cu. ft. per lb. of metal removed. Under preheat conditions the machining action is much more responsive to the oxygen stream, creating at once a need for closer control and the possibility of securing closer tolerances. From a metallurgical viewpoint, preheating is helpful because it retards the rate of cooling of the base metal adjacent to the cut, thereby reducing the hardening effect.

Successful flame machining depends upon the control and maintenance of a proper combination of operating variables relative to the work.

The next installment will explain electronic control of tracing heads and inexpensive templets guide flame-cutting torches.

CONTROLLED ATOMS or CONTROLLED LIVES

SINCE August 6th when the first atomic bomb was released over Hiroshima, the American people have been subjected to a continuous barrage of pronouncements on the use and control of atomic energy. Some of this comment has been strident, and much of it conflicting. A considerable portion of it has been of sincere and constructive excellence.

It has not been easy to separate the wise counsel from the merely noisy, and it is small wonder that the minds of many are troubled and confused.

However, the sheer mass of discussion poured into press and microphone has awakened us all to the gravity of the issue. In terms of any problem on which Americans ever have been called to exercise a judgment—This is It!

Even the dullest now recognizes that atomic weapons hang over modern civilization like the Sword of Damocles, and understands in some measure how fragile and taut is the hair of political balance that holds it suspended.

From this point on, we need the coolest and most carefully considered judgment that can be brought to bear. Discussion highly charged with emotionalism will but increase the tensions both at home and abroad, and render wholly insoluble a delicately intricate problem.

What Is The Problem?

The major outlines of that problem now are coming into focus in understandable terms:

1. The scientists have opened up a new and virtually unlimited storehouse of energy, and the engineers have discovered how to turn it into a military explosive incomparably more powerful than any we have known. We know that this energy may also be used to produce heat for useful power, and we suspect that the radioactive substances produced by the process in hitherto unimagined quantity may also have medical, industrial, and other constructive applications.

2. Terrifying as have been the demonstrations of the atomic bomb thus far, we know that they are as nothing in comparison with its potential destructiveness. The explosive force of individual bombs can be increased tremendously, and means for their effective delivery to predetermined targets in wholesale quantity already are at hand. The experts tell us that no practicable means of interception can be devised, and that reprisal in kind probably will be the only answer to an enemy attack with atomic weapons.

3. So far as we can see now, even successful retaliation would be at best an answer of hollow effect. Any two nations each having wholesale stock-piles of bombs could accomplish the practical destruction of each other. Since a first treacherous blow might well constitute an enormous advantage, a nation actuated by a ruthless urge to conquest or revenge might have the best chance of survival. But since the widest possible dispersal of bombs and launching units would be dictated by the strategy of atomic weapons, it is doubtful that one nation could destroy another without itself suffering destruction. On both sides the major centers of population could be wiped out, and the nation of least concentrated industrialization and commerce would suffer least. However, no one can be sure that the concentrated explosion of as many as 20 thousand atomic bombs would not poison the atmosphere of the world to an extent that would be fatal to great masses of population, not only within the country bombarded, but perhaps in the country which launched them.

4. The problem is further complicated because, so far as we know now, any large-scale commercial use of atomic energy as a power source is more or less inextricably linked to a potential military use. It is true that, if atomic power becomes economically feasible (which is by no means certain for a long time to come), it would require only low-grade concentrates of fissionable material, which would need further elaborate and costly processing before reaching explosive potential. But the process of producing such low-grade concentrates constitutes perhaps two-thirds of the industrial effort required to make effective bombs. It follows, then, that if nations were to equip themselves to produce large quantities of low-grade concentrates for power generation, the effort required to develop large-scale bomb production would be materially reduced. Moreover, the maintenance of an effective inspection to police agreements not to produce bombs might be forbiddingly difficult if atomic power generation were allowed.

5. In addition to the major problem posed by the use of atomic bombs in international war, any nation which produces or possesses such bombs, or the fissionable materials with which they are loaded, faces still another in the danger of their falling under the control of paranoid elements in its own population.

What Are We Going To Do About It?

We face the hard fact that we have produced a weapon capable of destroying whole nations—perhaps even the whole world. Although we were importantly aided in its development by the nationals of other countries, we, together with Great Britain and Canada, now must take the initiative in deciding what shall be done with it. We have only two choices. We can try to keep this weapon as a monopoly of our own, or we can try to place it under broad international control.

Can We Keep It To Ourselves?

If we know one certain fact about the atomic bomb, it is that it cannot long be held as a monopoly of those nations which produced it.

If Nazi Germany had succeeded in developing the weapon first, it probably would have attempted to achieve world dominion, with utter destruction as an alternative. Such a course is not within our range of choice. It violates every principle for which we stand.

Much reckless nonsense has been uttered concerning the inability of other nations to master the scientific, engineering, and industrial problems involved. It is the virtually unanimous opinion of those who worked on the project that several nations today are fully equipped in science, engineering, and industrial organization to produce atomic bombs and to provide the means for launching them. At least one of these nations, Russia, has also access to an ample supply of the necessary raw materials. The only debate is over whether it would take three, or five, or ten years for her to marshal her resources to produce bombs in multiple thousands. Once such an atomic race were on, we have no reason to believe that Russia might not divert more resources to the task than we ourselves should be willing to put into it.

Additional nonsense is talked as to how we might attempt to cope with the problem of living in a world in which mutually suspicious or hostile nations faced each other, with stores of atomic weapons on both sides. We hear talk of dispersing our cities and even of moving underground. No one has seriously reckoned the difficulty or the cost of following such counsel of despair. Still less has anyone appraised the neurotic effect upon men's minds of living by any such preposterous formula, under continuously mounting tension day after day, and year after year.

Certainly, if we could find no way to prevent the competitive production of atomic weapons, we should be driven at least to the selective dispersion of our bomb-launching facilities, of certain key industrial establishments, and of our centers of government and governing personnel. We should be forced, also, to change our traditional requirement that only Congress can commit us to active war. We should be forced to organize ourselves as a police or military state, with our scientists regimented and muzzled, with all of us under constant surveillance against the smuggling and planting of time-bombs, and constantly alerted against attack through the air.

Before we commit ourselves to any such intolerable procedure, we should be mad not to explore all possible means for making it unnecessary.

The Only Feasible Alternative Is Effective International Control

This cardinal principle has been recognized in the statement of November 15th, issued jointly by President Truman, and Prime Ministers Attlee and King. Their statement frankly concedes that against atomic weapons there can be no adequate military defense, that no nation can command a monopoly of such weapons, that responsibility for eliminating atomic energy as an instrument of war and for devising safeguards over its use for the advancement of science and other peaceful and humanitarian ends rests upon the civilized nations of the world.

They propose that a commission be set up at once under the United Nations Organization to make recommendations: (a) for extending between all nations the exchange of basic scientific information for peaceful ends, (b) for control of atomic energy to the extent necessary to ensure its use only for peaceful purposes, (c) for the elimination from national armaments of atomic weapons and of all other major weapons adaptable to mass destruction, and (d) for effective safeguards by way of inspection and other means to protect complying states against the hazards of violations and evasions.

Already criticism is leveled at the wording of the statement, at alleged omissions, at the wisdom of choosing the United Nations Organization as the medium through which to seek agreement in view of the weaknesses of the UNO Charter.

None of these issues should be crucially important. What matters is that an invitation has been issued in good faith for the nations of the world to meet and decide upon means for assuring the elimination of weapons, the existence of which no one can afford to tolerate.

The decision cannot be other than international; it will require the best thought of the best brains the world can muster. The smaller nations have an equal stake with the large, and from them may well come the most fruitful suggestions. But Russia now holds the key to the success or failure of our proposal. If she accepts our invitation, no other nation will refuse.

Alternatively, there will be an international armament race paced by atomic weapons. It will mean an end of free science, a severe policing and regimentation of international travel and trade, and innumerable restrictions upon those individual freedoms which we have just fought so desperately to preserve. This is the dismal prospect if we fail to arrive at a genuinely international accord on the control of atomic energy. But even this interval would promise to last only for an uneasy period, until someone started pressing the push-buttons on the panel-boards of extinction.

The only permanent solution lies in finding means to eliminate war itself. That we cannot hope to achieve overnight, but we can, and do hope that the nations will now agree to eliminate atomic weapons and their radioactive by-products as instruments of war.

If they do that, we can move forward more surely to the constructive development of the incalculably valuable resources that science has newly opened to our use. And, we can hope also for a progressive improvement in international understanding.

Unless the nations can reach agreement on this paramount issue of atomic energy, it is difficult to conceive of any vital issue on which they might agree.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Co., Inc.

THIS IS THE 42ND OF A SERIES

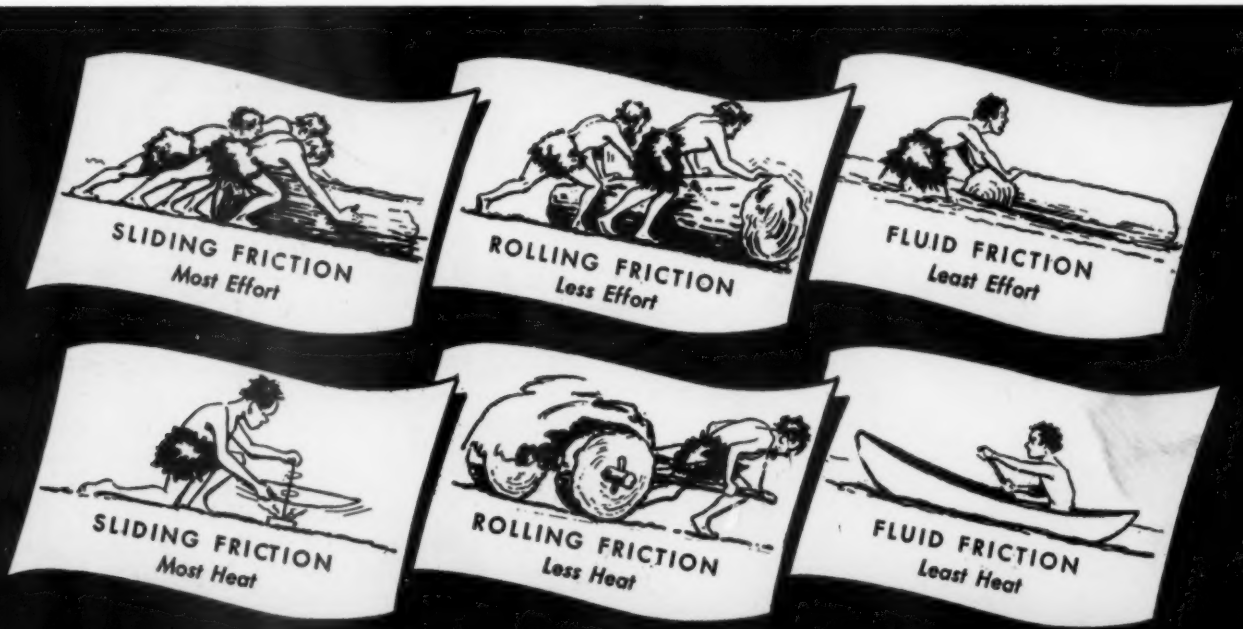
How To Lubricate Metalworking Machines

By Harold L. Flynn
Associate Editor

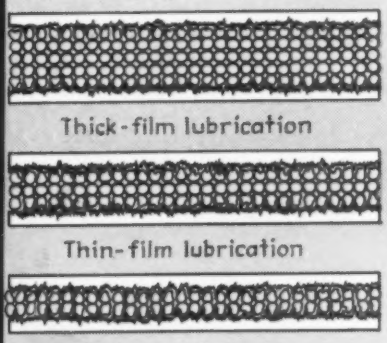
Friction, which works for the shop man in chuck and brake, works against him in bearings and on gears and ways. Oil and grease, properly applied, can make the effects of friction negligible. On this and succeeding pages, various types of lubricants, devices, and systems are described and their applications in various units of equipment are outlined

THE ANCIENTS KNEW FRICTION as something that made the going tough. Gradually they learned that the log that resisted the efforts of four or five stalwarts to push or drag it yielded to two who rolled it and still more readily to one who who got it into water. To start the log moving took more men than to keep it going. Rubbing the log with a stick heated the stick and wore the rubbing surfaces rapidly. Animal fat daubed on the surfaces reduced heat and wear.

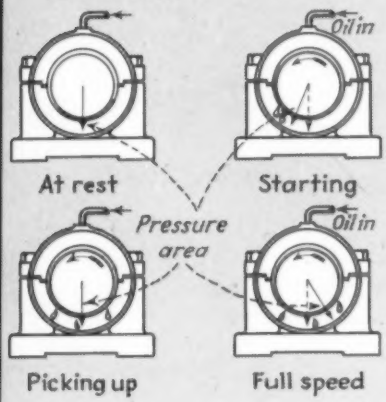
We can't guess how many centuries these hard lessons took to learn, or when they were first set down as laws of friction. We don't know when, probably through chance, primitive men learned that lubrication reduced work and heat. We do know, however, within reasonable limits, how to make friction work for us and how to keep it in check with lubrication. We have not yet completely learned how lubrication achieves its miracles, but we have made it man's servant. How it plays its part in the operation of our most precise production equipment is detailed in the pages that follow.



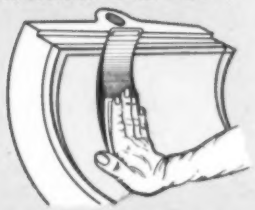
FORMS OF LUBRICATION



OIL WEDGE FORMATION

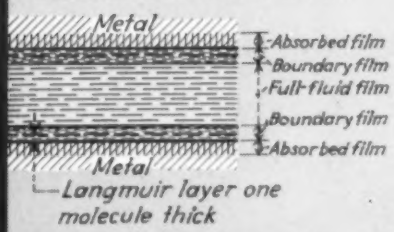


LAMINAR OIL FLOW



Oil layer adjacent to bearing tends to cling to surface while intervening layers slip over each other like a deck of cards. This internal shear is fluid friction.

BOUNDARY LUBRICATION



Oil absorbed by the metal surface helps support a condition of boundary lubrication. A boundary or thin film condition is a combined property of bearing surface and the oil. Degree of absorption affects lubricating values of boundary film.

RELATIVE OIL VISCOSITIES

In selecting proper viscosity of oil it is necessary to consider speed, running clearance and pressure to avoid power loss (too high a viscosity) and excessive friction (too low a viscosity).

FUNDAMENTALS

EVEN TWO POLISHED METAL SURFACES, when seen under the microscope, are made up of hills and valleys or asperities. Thus, dry or solid friction occurs when two solids slide over each other with no film or fluid between their surfaces. It causes wear, heat, welding and seizure and is a condition of failure in bearings. Oil molecules, under high internal pressure, tend to fill up the asperities. If a sufficient number of molecular layers are introduced between the two surfaces, these asperities move past one another without contact or interlock. The smoother the surfaces the fewer the molecular layers required to separate them. When surfaces are thus separated, we have full-fluid or thick-film lubrication. The only friction then occurring is between molecular layers (or slip planes) of the oil or fluid. Oil molecules have less objection to sliding past each other than they have to sliding past metal surfaces.

Under conditions of fluid friction, the lubricant is pulled between moving surfaces because of its adhesion to the bearing surface. The degree of fluid friction in thick-film lubrication is proportional to viscosity.

What Happens in a Journal

Formation of an oil film in a radial-bearing clearance is an example of the wedging or pressure tendencies of the oil molecule. When the journal is at rest, the oil film between it and the bearing is almost squeezed out at the bottom and the load is carried mainly by metallic surfaces. As the journal starts to rotate, it climbs up the bearing surface in a direction opposite to rotation. A portion of the oil fed to the bearing adheres to the slowly revolving journal. As speed increases, the oil is drawn by its viscosity and adhesion along with the journal and an oil film wedges itself between journal and bearing. The journal revolves with a thin film of oil until sufficient speed is developed to build up a film pressure great enough to separate the surfaces further. As this separation occurs and rotating speed of the journal increases, wedging action of the lubricant gains more force, lifting the journal to the side opposite rotation.

Ideal Film

The ideal lubricating film is created by choosing an oil of sufficient viscosity to allow pressure of the oil wedge to raise the journal and maintain separation of the metal surfaces. Viscosity determines the viscous drag responsible for the pumping of oil between the surfaces. The slower the motion the higher the viscosity required to create a complete oil film. As speed increases, a more-fluid or lower-viscosity oil is needed. When the load is increased, viscosity must be higher to resist any squeezing-out action. This physical property of a lubricant makes it resistant to forces tending to separate its molecules.

Boundary Lubrication

It is not always possible to maintain a thick or complete oil film between two surfaces. Where a thin oil film adheres to sliding surfaces, a condition of boundary lubrication exists, in which two oil-wet surfaces slide over each other without any fluid-separating film. Intermittent and restricted feeding of lubricant, low speeds, heavy loads, and too low a viscosity cause boundary lubrication or friction. When a machine is started or stopped, boundary lubrication occurs momentarily under most conditions.

In boundary lubrication, the oil film is considered to be greatly affected by the intermolecular forces of solid surfaces. The boundary film formed depends on the chemical nature of both the metal and lubricant, and the film strength of the lubricant.

Film Strength

While no standard scale or unit for film strength exists, it has been explained on the hypothesis of adsorption, suggesting "that the bearing metals have a stronger attraction for certain types of oil molecule than for others and that molecules of these types will separate out of the oil to form a tenacious concentrated film which will cling long after intervening oil layers have been squeezed out." A small amount of a compound such as lard oil in a mineral oil will reduce thin-film friction to nearly that obtained by the use of a pure

lard oil, and seems to support this hypothesis. Ability of the lubricant to adhere to the surface had a marked effect in the region of boundary lubrication.

Satisfactory operation in the region of boundary lubrication can best be assured by having film-strength characteristics in the lubricant used, through good surface finish, proper cooling areas for the bearing and by keeping the lubricant as clean and uncontaminated as possible.

Oil Grooves

Although the fluidity of oil aids in its distribution of lubricant along the length of a bearing, the completeness of this distribution can be assisted by proper grooving in the bearing itself. Grooves, properly designed, conduct the oil to high-pressure areas, never away from them. Length of bearing is of greater importance than its diameter in groove design. Sleeve bearings 8 in. and more long should have more than one oil inlet hole. Such holes will be connected by a straight axial groove extending to within about ½ in. of the ends of the bearing.

In considering the design for ring, splash or automatic-circulation lubricating systems, where oil supply is adequate and continuous, a straight axial groove cut through the oil-inlet hole in the low-pressure area of the bearing is satisfactory. For drop-feed, wick-feed and manual methods, the parting-line edges should be chamfered for part of their length to allow additional oil storage for feed intervals. All grooves should be rounded to prevent scraping the oil film from a journal. Wide and shallow grooves are objectionable.

Spiral or annular grooves are sometimes used in vertical bearings, aiding in oil-film formation and preventing leakage. In reciprocating sliding surfaces such as planer table and ways, grooves connected to the bearing surfaces by gradual chamfers may be used. If loads are heavy and motion slow, formation of a thick or complete oil film is unlikely and sufficient grooving should be provided to prevent dry spots. Such grooves form a network. Correct grooving aids formation of a good oil film, but must be combined with proper viscosity, film-strength, oiliness and stability for complete lubrication. When such an oil is distributed over the bearing surfaces by correctly designed grooves, the desired lubricating film will be maintained with minimum wear, maintenance, power and oil consumption.

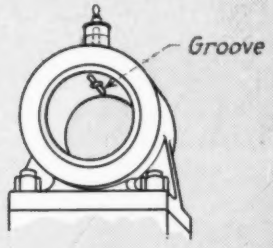
WE ACKNOWLEDGE

Suggestions and contributions of various oil and equipment companies have been invaluable in preparing the text and illustrations for this basic section. There is a substantial volume of lubrication literature available from these companies, covering both general and specific problems. In the near future, as a result of wartime experience and the return of pre-war personnel, improved data will also be available. Our thanks for contributions and suggestions are extended to the following companies:

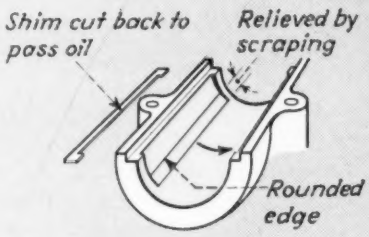
Alemite Division, Stewart Warner Corporation
Bijur Lubricating Corporation
Bowen Products Company
Bowser Company, Inc., S. F.
Brown & Sharpe Company
Cincinnati Grinders, Inc.
Cities Service Company
Cuno Engineering Company
DeLaval Separator Company, The
Ex-Cell-O Corporation
Farval Corporation, The
Gould & Eberhart
Gulf Oil Corporation
Houghton & Company, E. F.
Madison-Kipp Corporation
Norton Company
Pratt & Whitney Division, Niles-Bement-Pond Company
Pure Oil Company
Rivett Lathe & Grinders, Inc.
Sellers & Company, William
Shell Oil Company
Sinclair Refining Company
Socony-Vacuum Oil Company
Standard Oil of N. J.
Swan-Finch Oil Corporation
Sun Oil Company
Texas Company
Tide Water Associated Oil Company
Trabon Engineering Corporation
Warner & Swasey

OIL GROOVES

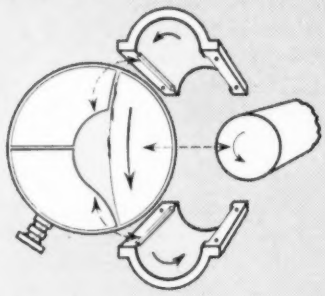
Single-axial groove



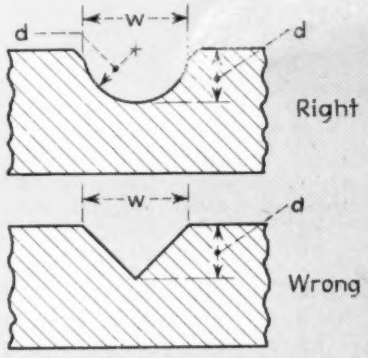
Two-part bearing



Relieved bearing surfaces



Oil groove cross-section
Flow in one direction



SUGGESTED GROOVE DIMENSIONS (Inches)

Bearing Diameter	Width w	Depth d
½-1	9/64	3/64
1-1½	3/16	1/16
1½-2½	9/32	3/32
2½-4	3/8	1/8
4-5½	9/16	3/16

Sources and Compositions

Crude petroleum stocks, from which all lubricating oils are processed, are located in the eastern or Pennsylvania district, mid-continent or Rocky Mountain district and the California and Gulf Coast districts. Paraffin-base, mixed-base and napthene-base crudes come from these respective fields.

What is Petroleum?

Crude petroleum is a complex combination of hydrocarbons with percentages of paraffins, napthenes and aromatics generally depending on the district of origin. Successive processes of distilling, redistilling, refining, secondary refining and chemical finishing treatments remove asphaltenes, wax and other undesirable compounds. Classification of lubricating oils is based either on the method of refinement, commercial application or on both.

Paraffin-base lubricating oils are less volatile than either napthene or mixed-base oils and are composed of highly stabilized saturated hydrocarbons. Napthene-base crudes contain more branch chain hydrocarbon unsaturates and aromatics than paraffin-base crudes. During refining these undesirable constituents are removed.

Modern methods of refining have removed most of the distinctions from paraffin and napthene-base oils and today they have general broad applications. Where wide variations in temperature exist, paraffin-base oils are generally preferred. On the other hand, napthene-base oils have been used with great success to meet average shop conditions.

Refining developments of the past few years have provided methods for importing required characteristics to either type of lubricant.

Dependent upon the refining process, lubricating oils may also be classed as:

1. DISTILLATES . . . Oils that have been vaporized and later condensed in refining, they may vary in viscosity from about 50 to 3000 S.U.S. at 100 F. They are used either as straight-cut oils or are blended with more viscous residuals to provide finished oils. All oils cut from stills and even residual oils used in blending are further processed. Cheaper oils naturally receive less refining.

2. RESIDUALS . . . Oils that have not been vaporized and condensed. Some of the dark cylinder oils for special lubrication are of this class. Mineral-oil mixtures of two or more cuts of different boiling ranges, such as a blend of viscous residuals and low-viscosity distillates are typical blended oils.

Compounded oils are prepared by adding animal or vegetable fats to mineral oils. Percentages of compound seldom exceed 15% and the compounded oils are rated by the kind and amount added. The minimum amount of compound required to achieve the specific purpose for which it is added provides the most economical compounded oil.

Oiliness and Film Strength

Where added oiliness is required, varying percentages of animal and vegetable oils, esters of chlorinated aliphatic acids and monohydric alcohols are added to the mineral oil. Film strength is improved by such compounding agents as lead soaps, sulfur and chlorides. Extreme-pressure lubricants for gears and other machine parts under heavy loads are

LUBRICANT TESTS AND

Chemical and physical tests of a lubricant are conducted by refiners and heavy consumers, aiding in control and analysis of the product. Their interpretation and significance is of interest to lubricant user only as it affects operations and as a guarantee of quality.

CHEMICAL

ACIDITY OR NEUTRALIZATION NUMBER—The general quality of a lubricating oil cannot be evaluated in terms of its neutralization number. Specifications should never include limits on this property unless it is known that an oil of low organic acidity is required.

OXIDATION—Oxidation numbers reveal little unless specific type of test apparatus is known. Increase in oxidation is reflected in an increase of viscosity and formation of lacquer.

PRECIPITATION—Indicates amount of so-called asphalt or tar in a lubricating oil. All new oils except the black oils have a zero precipitation number. The chief value of precipitation tests is in classifying the several groups of residual lubricating oils.

SAPONIFICATION—This is the reaction of a fat and an alkali to form a soap. Applied to a fatty or compounded oil this test measures the amount of fatty material in the lubricant. On used oils, the saponification number indicates degree of deterioration.

SULFUR CONTENT—Below certain small percentages, combined sulfur does not affect stability of oil nor is it corrosive. Sulfur and sulfur-compound content has become more important with the recent extended application of extreme-pressure lubricants.

CARBON RESIDUE—Some oils may be vaporized at atmospheric pressure and in the absence of air without leaving an appreciable residue, while other oils, upon distillation, leave a non-volatile carbonacious residue.

Chief significance of test is as indication of degree of refinements, but it must be correlated to the type of oil.

PHYSICAL

CLOUD POINT—Temperature at which water, wax and other sand substances in oil start to crystallize. Of interest in lubricating oils where wickfeed devices are exposed to relatively low temperatures. Of little value in most machine-tool operation.

POUR POINT—A test of suitability rather than quality, and indicates temperature below which it would be dangerous to use a lubricant in a gravity-circulating system, especially where the reservoir producing the flow is small. It is the temperature at which oil will just flow.

COLOR—Color tests are generally accepted as an index of the uniformity of a certain grade or brand of oil and not as an indica-

minerals oils compounded for peak film strength.

Additives

Typical agents added for resistance to oxidation include phenolic and amino derivatives, disulphides and compounds of phosphorus, antimony, and selenium. Corrosion inhibitors often added are either non-metallic organic compounds or compounds of phosphorus, arsenic, chromium, bismuth and mercury. There are many additives in commercial use, their selection being based on specific operating conditions. The number of additives being successfully used by the oil indstry is substantially increasing and meeting many special lubricating problems.

Fixed Oils

Oils and fats, while classed as lubricants, are not used as such in modern machine-tool lubrication. Found in all animals and in the seeds of plants and vegetables, they are known as fixed oils and cannot be distilled without decomposition. Some of these fixed oils are used in the compounding of industrial lubricating oils.

Oxygen content of fixed oils is from 9.4 to 12.5%. They are insoluble in water but soluble in organic solvents and mineral oil. Their viscosity is less affected by temperature and pressure than that of mineral oils. Because of their high oiliness or lubricity, fixed oils are important compounding agents for mineral oils. Sperm, lard, and olive oil, non-drying in type and comparatively slow to oxidize, are among the best for lubricating-oil agents. Tallow oil, degras and rape-seed also run into considerable volume.

Greases

Under certain conditions the plastic nature of a soap-thickened oil is preferable to the fluidity of the lubricating oil itself. Greases, which are mixtures of a soap (alkali and fatty compound) and mineral oil, are then indicated. Greases most frequently used in machinery lubrication are the lime-base, and soda-base and mixed base for ball-bearings.

Lime-base grease as typified by calcium-base or cup grease, contains from 70 to 90% mineral oil and the remainder is essentially soap. It is a general-purpose grease for application at temperatures under 175 F on plain bearings and sliding surfaces. Various lubricating oils ranging from light spindle to heavy, dark residual oils give this and other types of grease, capacity to function under a wide range of conditions. Lime-base grease is water-repellent.

Soda-base greases, where the alkali is caustic soda, are suitable for high temperature and speed conditions. Anti-friction bearings, plain bearings and ways may be lubricated with this type of grease. When applied by a centralized pressure system, a light grease of non-separating qualities helps avoid clogging of lines or ports.

Mixed-base greases combine the characteristics of lime and soda-base greases. The presence of lime-bases modifies the fibrous condition of soda-base greases and offers a low resistance to initial motion. Where lubrication is infrequent, oxidation inhibitors are included in grease. Ball-bearing engineers prefer an excess of soda content in these greases.

Greases are specialized products of highly adhesive characteristics. They form tenacious lubricating films suitable where small quantities must be used to avoid throw and drip.

Lime, soda and mixed-base greases are generally manufactured in consistencies from No. 0, the softest, to, No. 6. Greases outside this range are available for special purposes from extreme fluidity to brick-like consistency. Method of application, possibility of leakage and operating temperature dictate the consistencies.

WHAT THEY SHOW

tion of quality. Commercial grades of oil are indicated by color.

FLASH AND FIRE POINTS—Tests do not determine suitability of lubricating oils. To the user they sometimes serve as a check on uniformity and indicate whether they have been contaminated with lower flash point oils. To the distiller they serve as a control measure. Flash and fire points are also safety measures for storage and transportation of oils.

EMULSIFICATION — If a mixture of oil and water breaks or separates quickly its harmful effects are reduced. Properly refined oil separates quickly and is desirable for circulating systems or hydraulic operation. Demulsifiability tests indicate how long it will take an emulsion to separate. Retention of good demulsibility during use is as important as initial demulsibility.

EVAPORATION—Evaporation tests indicate a possible excess of lighter oils. Evaporation rate in service due to variable conditions is determined by comparative tests. Low flash-point oils evaporate more quickly than those with high-flash points.

COMMERCIAL VISCOSITY—Viscosity, the internal friction or body of an oil, is measured in the United States by Saybolt Universal Seconds. Saybolt Universal Seconds (S.U.S.) ratings are the number of seconds required for 60 ml. of oil to flow through the orifice of the Saybolt viscosimeter at specified temperature, 100 or 130 F for lighter oils and 210 F for heavy viscous oils. A commercial rating widely used by industry. Kinematic viscosity tests are used in laboratory work because of accuracy and then transferred to S.U.S.

VISCOSITY INDEX—Numerical index of relation which the Saybolt viscosity of an oil at 100 F bears to Saybolt viscosities of an average paraffin and napthene oil at that temperature, all three having the same viscosity at 210 F. The average paraffin base has been assumed as 100. Index indicates viscosity changes with temperature. Mixed base lubricants fall between 0 and 100. Special refining and addition of viscosity-index improvers have produced oils as high as 200 V.I.

SPECIFIC GRAVITY—For volume purchasing, weight of a gallon of oil is derived by multiplying specific gravity by 50 and dividing by 6.

WATER AND SEDIMENT—Water usually enters an oil after it has been received from the refinery, if at all. It gives all but dark oils a cloudy appearance. If upon heating to just above 210 F, the oil becomes transparent, water is present. It is particularly objectionable in wick-feed and circulating systems. Sediment is easily detected when the oil is transparent.

Typical Lubricators

As vital to the performance of metalworking machines as the proper lubricant is an effective and reliable means of transferring it to specified bearings. Requirements of these bearings depend upon speeds, pressures, clearances, continuity of operation and relative importance of function in the unit.

Certain bearings, gears and ways will demand continuous lubrication to maintain a full fluid film. Others will require intermittent but measured lubrication or small amounts of oil infrequently. Higher quality lubricant will be used in automatic and continuous systems, with lower viscosities for high speeds and low clearances. For manual application, where the lubricant is not collected for re-use, chemical stability is not important but film strength and lubricity are.

Desirable Elements

A desirable lubricating system should be:

1. Reliable—cutting off lubricant supply results in damaged bearings.
2. Accessible—for ready cleaning to remove any sludge deposits.
3. Easily filled—large and accessible filling ports save time and prevent waste of lubricant.
4. Feed regulated—to supply complete lubrication, to prevent overheating and excessive wear.

Oldest of oiling devices is the hand oiler or squirt can. While low in cost, it either over- or under-lubricates and is only used on rough machinery and open parts which move slowly. It supplies fittings on machine tools where small amounts of oil are required for lightly loaded bearings.

Light- and drop-feed oilers of various designs are an advance over hand oiling and supply lubricant to some plain and anti-friction bearings on older equipment. A small cup or reservoir which supplies oil through an adjustable needle valve to the bearing is a common type. Starting and stopping is controlled by a snap lever, which does not affect rate of feed adjustment. A glass window shows oil level. Feed must be adjusted each time the machine is started to compensate for changes in oil level and surrounding temperature. Some drop-feed oilers are temperature-regulated by bearing surface heat, while others have a constant oil-level arrangement, operating on the principle of a barometer and feeding oil only when level in the bearing reservoir is low enough to break a liquid seal and allow air to enter the oiler.

Wick Oilers

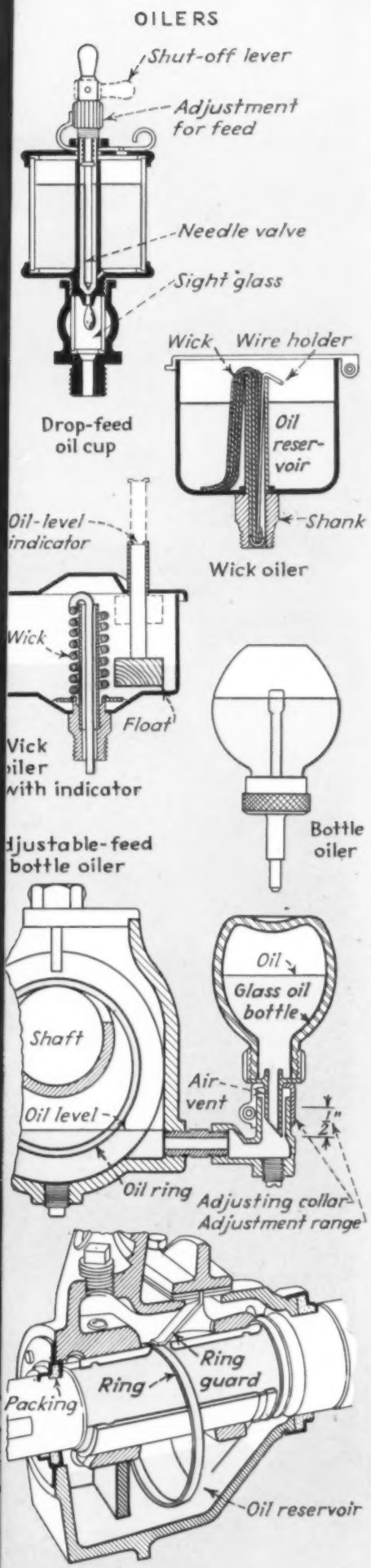
Wick-feed oilers, operating on the principle of capillary action, are commonly used to lubricate bearings, guides, slides and spindle bearings. Oil is absorbed by the ends of the strands immersed in the oil reservoir, passes along the strands and is carried to the inlet that delivers it to the bearing.

Rate of oil flow is determined by the number of strands and the length of wick extending down the tube to the journal below the level of the oil in the reservoir. The outer end of the wick will show no flow if hanging less than ¼ in. lower than the inner wick, but beyond that increases 1 drop every 4 sec. with a 4-in. difference in length. Because of the siphoning action the higher the wick lifts oil, the less the flow, a ⅛-in. lift giving a drop every 10 sec. and a 2-in. lift giving a drop every 65 sec. To have a uniform rate of feed, the discharge end of the wick should be 2 in. below the lowest level of oil in the reservoir.

Uniform Delivery

A shallow reservoir or cup and a shank of sufficient length provides a more nearly uniform oil delivery for all oil levels. Minimum rate of feed should always be greater than minimum bearing requirements. A wire holder at the discharge end maintains correct position of the wick and facilitates its removal when the machine is stopped. Rate of feed is controlled by the number of strands applied, their size, or by a screw which can be pressed against the wick to shut off flow.

A bottom-feed wick oiler with oil



AND SYSTEMS

reservoir below the journal is automatic. Oil feeds upward to the journal solely by capillary action through wool or cotton waste pressed against the lower side of the journal. Excess oil drains to the reservoirs and is re-used. As capillary action will not lift oil more than 2 or 3 in., the oil level should be kept high.

Bottle Oilers

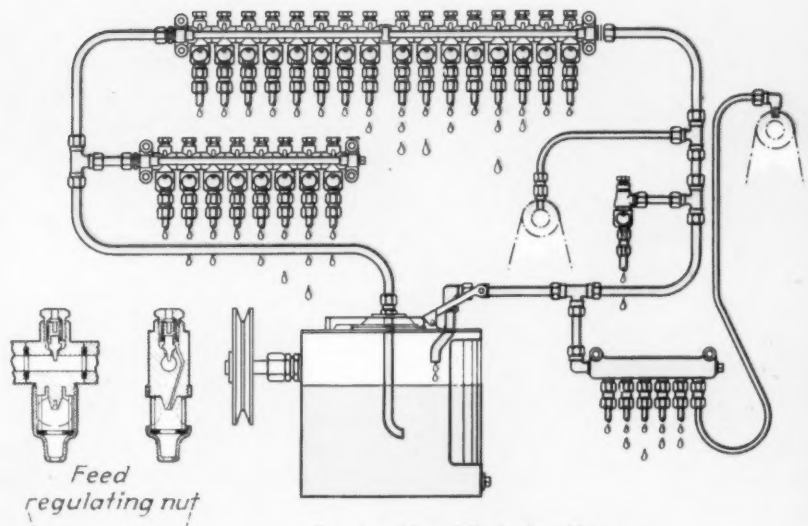
Bottle oilers, inverted oil reservoirs with a steel or brass feed spindle, a threaded neck and a base integral with the shank, supply small but continuous amounts of lubricant to bearings. Starting and stopping of the oil supply is controlled by motion of the journal which causes the plunger to be alternately raised and lowered. As temperature of the journal rises the oil thins out and flows more freely.

Re-use of lubricant is possible through ring and collar oiling. Oil is carried to the bearings from a reservoir in the bearing housing rotating rings which ride loosely on the revolving journal. Longitudinal grooves help distribute oil along the top half of the bearing. Collar-oil bearings are lubricated by the oil carried upwards by collars rigidly fixed to a revolving journal. This oil is later scraped from the collar and distributed along the journal top by troughs which receive and direct the supply. Rate of flow may be slower than in circulation oiling systems.

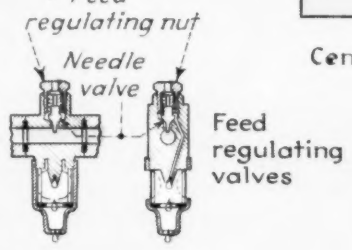
Bath Oiling

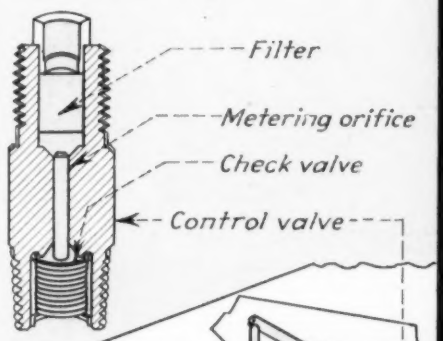
Bath oiling is one of the simplest methods of insuring adequate lubricant supply and maintaining a thick oil film on bearing surfaces. Feed-transmission gears are lubricated by partial immersion in an oil-tight housing. Step, spindle and thrust bearings can be lubricated in this manner. Design conditions must easily and economically allow construction of oiltight reservoirs. Oil level must be rigidly maintained. Constant oil-level devices are desirable. Frequent inspection and periodic draining and refilling of the reservoir are required maintenance.

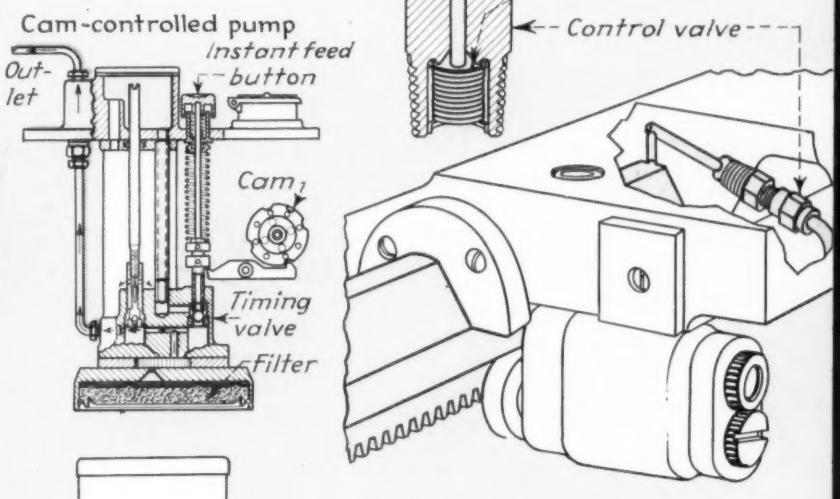
Splash-oiling is an efficient method



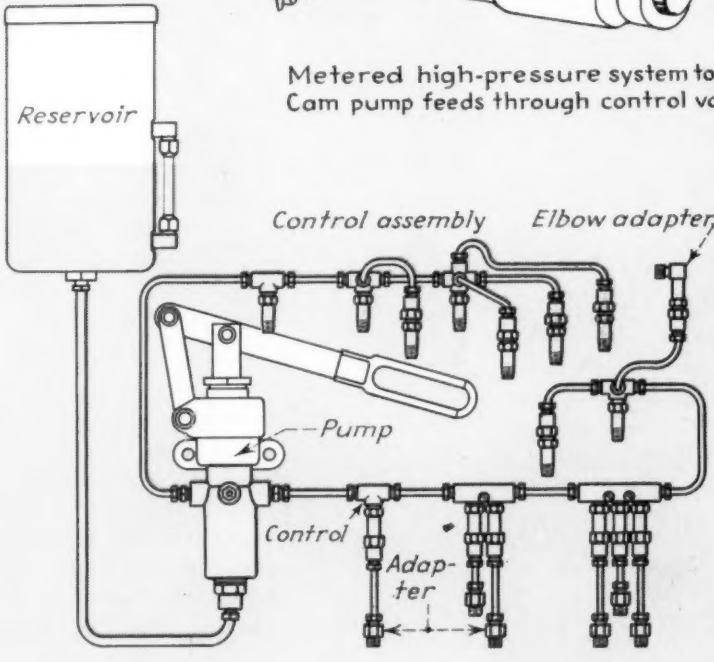
Centralized lubricating



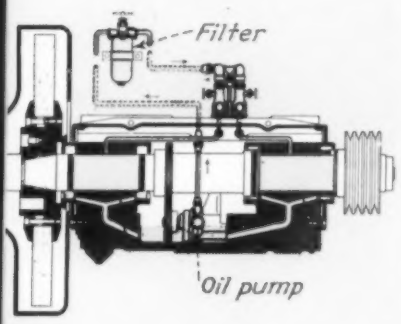




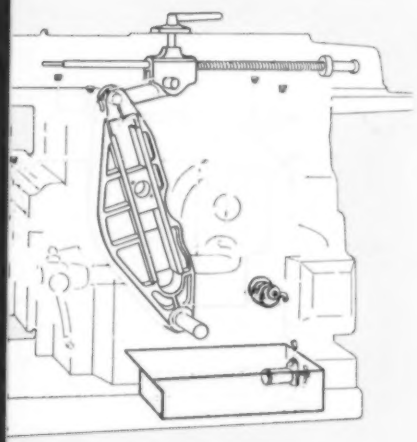
Metered high-pressure system to way
Cam pump feeds through control valve



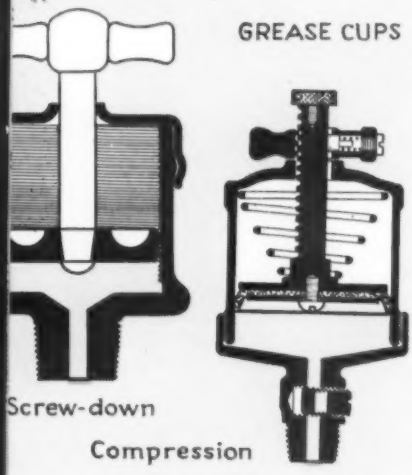
Single-line hand-operated lubricator

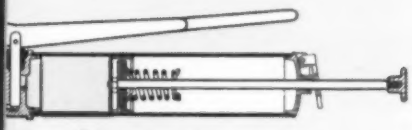


Continuous lubricating, measured feed

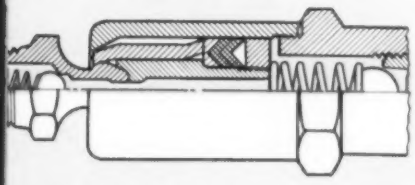


irculating splash system





Grease gun
High-pressure type



Typical grease-gun fitting

of lubricating enclosed gear sets. Gear teeth dip into the oil and spray it to all parts of the casing, where it is collected in troughs and pockets and drains to the bearings and back to the reservoir. Oil level should be maintained at correct height. If too low, bearings don't get enough oil—if too high, excessive churning, high oil temperature, leakage and high oil consumption result. Regular draining of the reservoir and frequent checking of the oil prevents excess sludge formation. The atomizing action of splash lubrication makes the oil susceptible to oxidation, so the reservoir should be regularly drained and the oil inspected frequently.

Central Systems

Centralized oiling systems, supplying measured quantities of oil to various bearings under pressure, are available in continuous or one-shot types. One design of a hand-operated system has a central pumping-reservoir, line-distributing system and an automatic control valve at each bearing. A hand lever is pumped until required pressure shows on the gage and pressure is developed throughout the system to discharge all control valves to the bearings. The lower end of the piston seating on the shoulder of the valve acts as a cut-off valve and prevents more than the measured quantity of oil from reaching the bearing.

A continuous type can be driven from a rotating shaft or reciprocating member of a machine, and feeds oil to the bearings at a slow and continuous rate, depending upon diameter, stroke and speed. Control valves work in conjunction with central-pump units of this type. Another type has a pump-reservoir unit driven by the machine served or a separate motor, a single line feeding the control valves. Control valves are adjusted individually to feed as little as 1 drop in 10 pulsations or as many as 5 drops in 1 pulsation.

Circulation Systems

Circulation systems provide thick-film lubrication and are used where a continuous supply of oil is required. A pump, located in a reservoir, draws oil and forces it under pressure to the bearings after which it drains by gravity to the reservoir. The pump is usually driven by the machine and oil pressure controlled either by a pressure relief valve or size of bearing orifice. Strainers are placed in the system to collect dirt and contaminating matter. Proper vents maintain atmospheric pressure in the reservoirs. Cooling coils are sometimes used. Samples of oil should be taken from the system and occasionally checked to find out if water or sediment has been accumulated.

Selection

Temperature, load, speed and frequency of use will govern selection of a suitable lubrication device or system. Machine-tool designers recognize this in design, and modern equipment is usually equipped with adequate means of delivering lubricants to bearings. Where the high grades of lubricants are required in quantity, the more automatic systems are most economical over a long period.

Grease Systems

Methods of applying grease include screw-down cups, compression cups, pressure guns, mechanical lubricators or grease packing. Screw-down cups requiring manual operation are used under moderate service conditions, for medium to fairly stiff grease requirements. Compression grease cups provide a more constant supply of softer grease.

Pressure application of No. 1 or 2 grease is generally used on machine bearings by means of a gun or mechanical lubricator. Guns may be screw or hydraulically operated or of the gat-type for high pressures. Where grease guns are used, special fittings of various types are required. Pressure grease systems flush the bearing of the old grease and impurities, reduce grease wastage and prevent entry of dirt through the grease hole.

Where the number and type of installations warrant, centralized greasing systems have been applied, replacing the point-by-point method. Supply of grease is from a central pump and is directed to bearings through either single or double lines. Feeder valves in the lines measure grease distribution to each bearing. Machinery need not be stopped when greasing by this method. Presses, punches, shears and continuously operating processing machinery may be efficiently served by any one of a number of centralized systems.

GEARS, WAYS, SLIDES AND BEARINGS

GEARS, ways and slides, sleeve and anti-friction bearings of spindle mechanisms are the main points of machinery requiring lubrication for continuous function and production efficiency. However, no bearing surface is unimportant and selective lubrication by various oils and greasing schedules is essential for all points.

When considering lubrication, such factors as load, speed, temperature and bearing characteristics must be analyzed. Whether the bearing in question is continuously or intermittently used will determine what system and lubricant is required.

Machine gearing performs many functions, such as main drive, table drive, apron control, quick change of feeds and speeds and raising and lowering of loaded machine elements. Gears of modern machines are usually precision cut, designed for low clearance and carry high unit loads.

Requirements of the ideal gear lubricant are:

Adhesiveness, to remain on the teeth and resist centrifugal force.

Viscosity, to form a suitable oil film, regardless of tooth pressure or temperature.

No tendency to become hard or brittle at a reduced temperature.

Enough oiliness or lubricity to reduce possible tooth-to-tooth friction to a minimum during boundary lubrication.

Low service cost.

To prevent metal-to-metal contact between meshing gear teeth, an efficient oil wedge is required in the area of contact. Throughout all stages of mesh, roll and slide of gear action aid each other in formation of a fluid lubricant film.

The combined effect of rolling and sliding is greatest during the earlier and later stages of mesh and it is during these stages that a wedge is most

GENERAL LUBRICATION RECOMMENDATIONS FOR MACHINE TOOLS

PARTS TO BE LUBRICATED	GRADE (Approximate Viscosity of Oils shown in Seconds, Saybolt Univ. at Temperature Indicated)	DESCRIPTION
HYDRAULIC SYSTEM		
Low Viscosity	150 at 100F	Premium-quality Oil, Rust and Oxidation Inhibited.
Medium Viscosity	300-900 at 100F	Premium quality Oil, Rust and Oxidation Inhibited
MACHINE, GENERAL		
Hand, Mechanical, Splash, or Circulating Systems:		
Low Viscosity	200 at 100F	Well-refined, Straight Mineral Oil*
Medium Viscosity	300 at 100F	Well-refined, Straight Mineral Oil*
High Viscosity	500 at 100F	Well-refined, Straight Mineral Oil*
GEARS (Not lubricated by general machine oil)		
Mineral Oil	SAE 90 or 140	Well-refined, Straight Mineral Oil. High film strength.
Extreme-pressure Lubricant	SAE 90 or 140	Lead-soap Base, Non-Corrosive, Mild-Type Extreme-pressure Lubricant. High film strength.
Worm Gears	SAE 90 ot 140	Lead-soap Base. Non-Corrosive. Mild-Type Extreme-pressure Lubricant. High film strength.
SPINDLES		
Oil Lubricated		
High Speed, Small Clearances	45 at 100F	Well-refined Distillate Oils (Blends containing kerosene can be used, but are not preferred). High film strength.
Medium Speed, Small Clearances	60 at 100F	Premium quality Straight Mineral Oil. High film strength.
Low Speed, Medium Clearances	110 at 100F	Premium-quality Straight Mineral Oil.
Grease Lubricated	NLGI Grade No. 1 or 2	Mixed-base (Sodium-Calcium) Premium-grade Grease containing low-viscosity oil.**
WAYS		
Mineral Oil		
Medium Viscosity	300-500 at 100F	Well-refined, Straight Mineral Oil.
High Viscosity	700-1000 at 100F	Well-refined, Straight Mineral Oil.
Compound Lubricant		
Medium Viscosity	300-500 at 100F	Well-refined Mineral Oil compounded with 2-7% Fatty Oil.
High Viscosity	1000-2500 at 100F	Well-refined Mineral Oil, compounded with 5-10% Fatty Oil.
Extreme Pressure Lubricant	SAE 80, 90 or 140	Lead-soap Base, Non-Corrosive, Mild-Type, Extreme-pressure Lubricant.
GENERAL GREASE LUBRICATION		
Normal Temperature	NLGI Grades No. 1 to 3	Mixed-base (Sodium-Calcium), Premium-quality Grease containing low-viscosity oil.**
High Temperature	NLGI Grades No. 1 to 4	Sodium-base Grease made with refined Residual Oils
Anti-friction Bearings		
Normal Temperature	NLGI Grades No. 2 and 3	Sodium-base Grease, maximum oxidation and separation resistance, high consistency index.
High Temperature	NLGI Grades No. 3 and 4	Sodium-base Grease, maximum oxidation and separation resistance, high consistency index.

* Oils containing Rust and Oxidation Inhibitors are desirable.
** Preferably containing Oxidation Inhibitors.

effective. Combined rolling and sliding is least effective at pitch line, and under gradually increasing load it is here that thick oil films first give way to boundary or thin-film lubrication.

Oil Wedges

When two gear teeth pass through mesh, the oil wedge always points toward the root of the driving tooth. To form strong oil wedges, tooth surfaces must be well coated with oil as they slide into contact. This is done by feeding the oil to the gear teeth as they approach mesh, which is automatically guaranteed in splash or bath lubrication. When the oil is sprayed to the teeth by pressure circulation, spray nozzles should be placed on the incoming side of mesh. Where gears operate in either direction, oil should be fed to both sides of mesh.

With an ample supply of oil, speed assists in forming and maintaining a good oil wedge. At high speed more oil is drawn into the pressure area, and the time available for oil to be squeezed from between meshing teeth is short. Oils of lower viscosity may then be used. At low speeds oil can be squeezed out more easily and less is carried into the pressure area, calling for a heavier oil.

If oil in a splash-lubricated gear set becomes too viscous the gears will channel a groove through it and insufficient oil will be carried to point of mesh. This may occur after shut-down or if temperature drops.

Excessive pressure of shock loads may rupture lubricating films and necessitate a more viscous oil. Splash system oil runs hotter than circulating oil which is sprayed on meshing surfaces and requires higher viscosity.

Proper venting and filtration will help in keeping water out of gear cases. Water and oxidized or dirty oil may form a permanent emulsion, causing excessive wear of gears and bearings by interfering with formation of an effective oil film, or by restricting the amount of oil flowing through pipes and oilways to gears and housings.

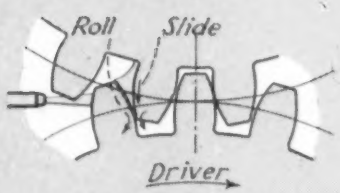
Where pressures are high, an oil of mild extreme-pressure characteristics should be used. Oil levels of gear housings should be checked when machine is stopped. Gears on most machine tools are served by automatic lubrication, minimizing danger of dry friction.

Ways

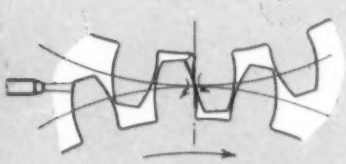
Worktables, saddles and heads slide on ways; which vary in shape. Horizontal reciprocating tables may ride on V-ways, inverted V-ways or on one V-way and one flat way. Motion may be slow, with either high or low pressure. It may be the relatively slow reciprocating motion of a planer under heavy load, or the rapid motion of a grinder table or shaper ram under lighter load.

Rate of sliding may vary from 0.001 in. to 200 ft. a minute. At low speeds, duration pressure tends to squeeze oil out of the bearing surface. Heavy loads have a similar action, and lubricants are more inclined to "iron out" than in radial bearings. Chatter occurs at stroke terminals because of severe wiping action, and failure of oil film.

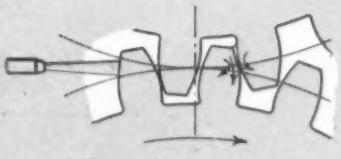
OIL-WEDGE FORMATION IN MESHING GEARS



Interval of approach

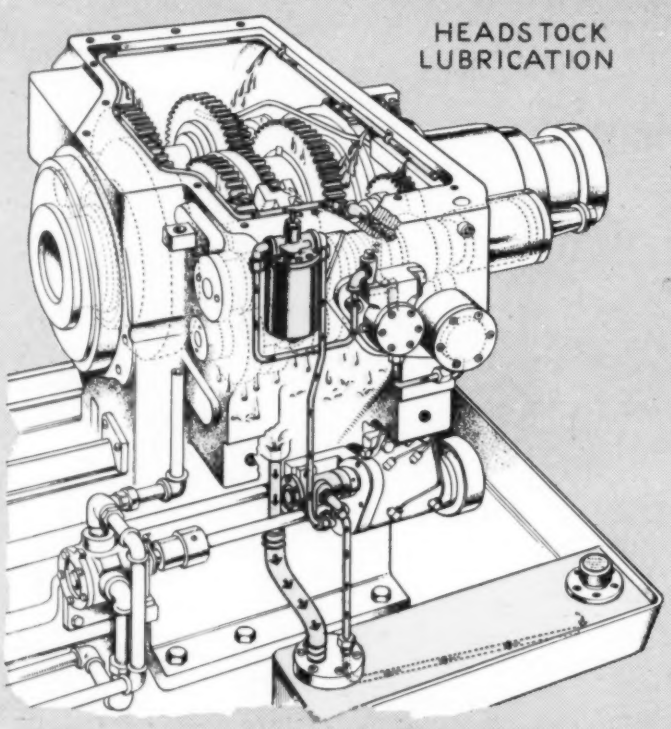


Contact on pitch line



Interval of recession

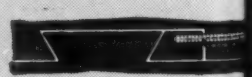
HEADSTOCK LUBRICATION



Filtered oil under pressure is fed through a perforated copper tube supplying oil to gears and their bearings. Spindle bearings are served through separate tubes from inside the headstock. Oil drains to headstock reservoir. A combination of splash and pressure lubrication.

Double V-ways

V-and flat way



Dovetail way

Inclined V and flat way

Inverted V-ways

Horizontal opposed V

Because of greater precision requirements, clearances are becoming lower. Increase of viscosity can therefore be but a partial solution, as an oil too viscous would allow excessive table wobble. Extreme pressure additives have cleared up many cases of table chatter. Improved design of oilways to allow entry of lubricant at properly spaced points and more constant supply has done much to improve performance and prevent excessive wear. Where clearances are very low the addition of oiliness agents has reduced power losses.

Entry of dirt to the ways has been lessened by telescopic and other types of guards and improved filtration in automatic lubrication systems for return oil.

On some machines, main table slides are mounted on balls or rollers running in hardened and ground ways. The weight of horizontal rotary tables is often carried on circular ways, usually flat. Both of these constructions are adaptable to bath and oil-level lubrication and oil condition should be carefully checked at regular and frequent intervals.

Horizontal and vertical ways may be lubricated by applying oil directly to rubbing surfaces. Oil holes or pressure feed pipes carry the lubricant to the slides at several points along the ways. Application is made by manually operated one-shot oilers or automatically accomplished by gravity or pressure circulation.

In certain types of boring mills considerable thrust is exerted on the spindle or boring bar, especially on the horizontal type. V-tracks are built on either side of the spindle and require careful lubrication to take up operating thrust, employing pressure systems.

The ways of mechanisms carrying heavy, intermittent loads at slow speeds are often lubricated by grease under pressure, both by gun and mechanical means.

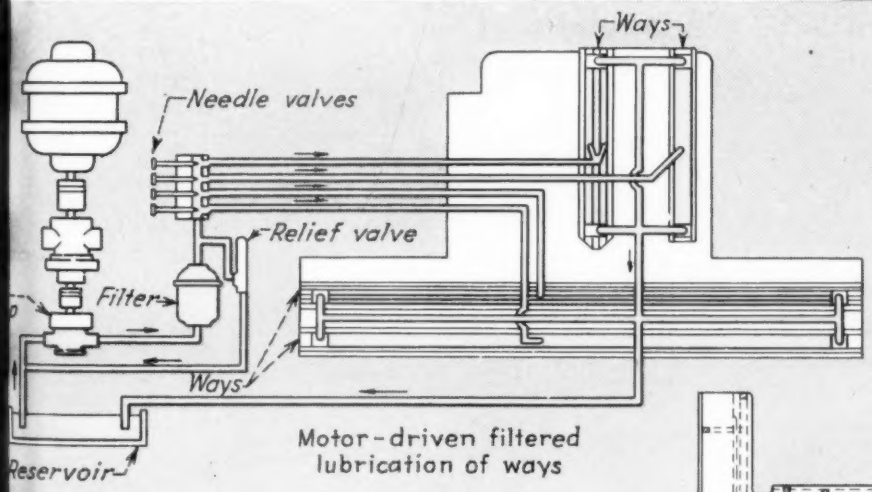
Spindles

Spindle mechanisms range from low to very high speeds. Sleeve, shoe-type, ball and roller bearings carry spindle loads. Internal-grinder wheel spindles reach extremely high speeds and surface grinders take heavy cuts, requiring varied means of lubrication.

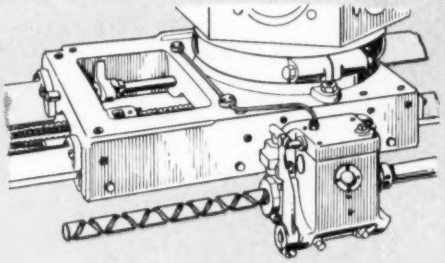
Spindle bearings in some grinders are completely filled with oil under slight static pressure, created by a standpipe on top of the wheelhead. Gravity float switches on the wheelhead automatically shut off current if the oil goes below required level. Circular sight gages allow constant inspection of oil condition. If the oil is lighter in color, it is probably diluted with coolant. If darker it is dirty. In either case the oil reservoir should be drained and refilled with clean oil.

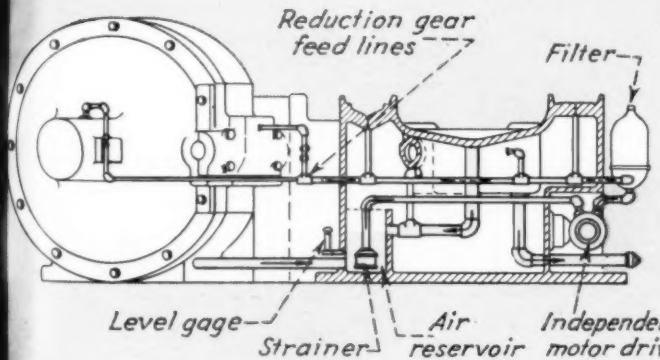
Small high-speed spindles are usually self-contained. Oiling by hand is not uncommon. Ball bearings dip into small oil reservoirs within the housings. Felt plugs or wool wicks are used to feed oil from reservoirs to housings, and in small units oil leaks away and is only used once.

Bearings on larger grinding-wheel spindles are supplied from self-contained reservoirs in the wheelheads by wicks, impeller oil rings or by self-contained pumps in which the drip drains back into the reservoir.

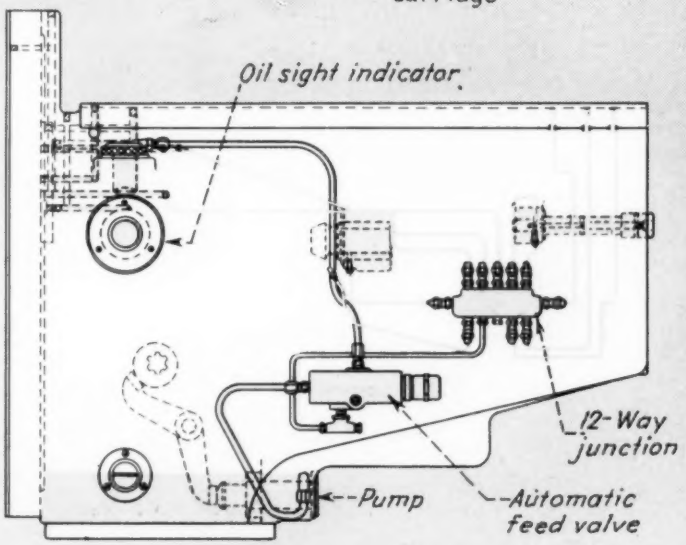


Motor-driven filtered lubrication of ways

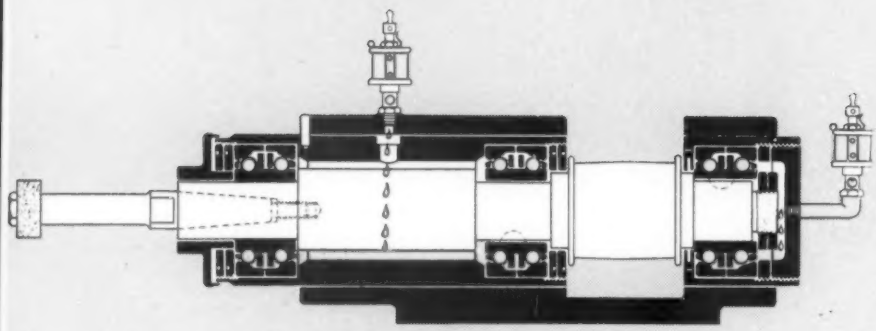

Automatic bedway lubrication from Carriage



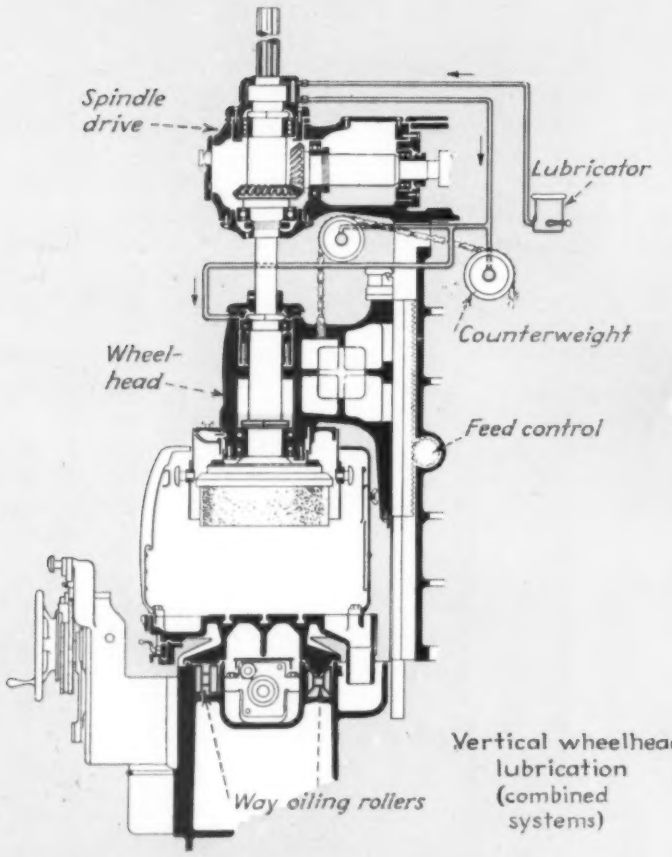
Force-feed lubrication of planer



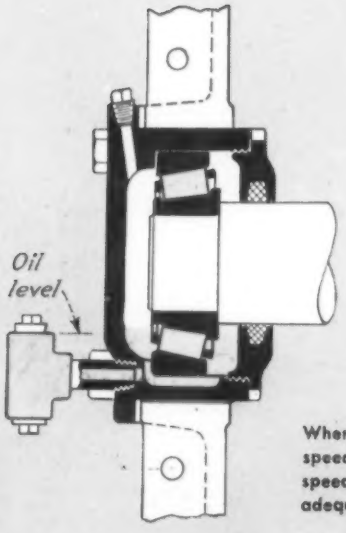
Knee oiling of miller



Grinding-wheel spindle
drop-feed lubricated



Vertical wheelhead lubrication (combined systems)



Bath lubricating roller bearings

Wherever possible oil is used to lubricate high speed ball or roller bearings, especially in high speed grinding spindles where accessibility is adequate.

Still larger spindles may be flood-lubricated by a pressure circulation system supplied from the base of the machine.

Operating speeds of wheel spindles require low-viscosity oils that quickly flood warm surfaces. When the oil is too heavy, fluid friction within the oil itself generates heat which must be dissipated by radiation or cooling coils. As clearances are lowered and speeds raised, progressively lighter oils are needed. Where clearances approach zero the oil must be light and free-flowing, with high film strength and oiliness. Chemical stability must be high because of continuous circulation and churning.

Where cams are involved they may be lubricated by hand, drop-feed or from a central system depending on service conditions. The many points of bearing in machinery, particularly the less hardened or supplementary bearing points are served by many systems and varying grades of lubricant. Machine-tool manufacturers cover these thoroughly with recommendations suited to specific tools and bearing points. Operating conditions will indicate the best system and lubricant.

Anti-friction Bearings

In anti-friction bearings, load-bearing areas are small and produce high unit pressures. Unless the lubricant has enough viscosity to form an adequate film, metal-to-metal contact will occur, resulting in wear and noisy operations. A full or thick film cushions the balls or rollers as load is alternately applied and removed during each revolution.

The viscosity of oil and consistency of greases is affected sharply by changes in speed and temperature. Above 150 F comparatively viscous oils or special greases are required. Unless a high-quality grease is used, oxidation will cause premature deterioration of the grease.

Oversupplying anti-friction bearings, particularly with grease, will cause excessive friction and binding of the balls or rollers and races. Excessive heat also loosens the inner race from the shaft and causes misalignment and pounding. Where speeds are higher than 25,000 rpm., oil is preferable as an anti-friction lubricant if it can be applied by atomized fog.

Care and Handling

Getting the right oil into a machine by the right oiling system will cure or prevent most lubrication headaches—but not all of them. Storing, handling, routing of lubricant to point of application and purification methods contribute to performance, efficiency and cost reduction. The best oil, shipped in perfect condition by the refiner, will give trouble if exposed to contamination in the initial stages of storing and handling.

Lubricant Control

Much damage has resulted from getting the wrong lubricant to a machine bearing. Automatic lubricating systems have helped avoid this type of misapplication because oil changes are comparatively infrequent and delivery to the bearings prearranged. The margin for error is still present, particularly where oil delivery is manual or by an intermittent device. Charting systems, identifying the lubricant from storage to bearing, have tightened control of oil scheduling and enabled lubricating personnel to avoid costly mistakes.

Close control of lubricant application is essential, particularly where a great variety of equipment and special-purpose requirements exist. In view of the many variables present in plant operation, inauguration and administration of control systems must be a plant responsibility. No system has yet been devised which will successfully meet the needs of all plants. Employment of skilled personnel for lubrication departments, analysis of requirements and clear and concise lubrication charts at points of application will help maintain efficient machine operation.

Storage

Cleanliness in storage and handling of oil prevents contamination before arrival at the machines. If lubricants are used in great volume, storage in a specified room is desirable. Such a room can be fireproofed, air-conditioned and arranged for "one-level" handling. Such a setup minimizes the danger of drum-seal breakage and is comparatively free of processing dust and particles. Placing of barrels on their sides during storage prevents collection of dust and dirt on the heads. Where outdoor storage is necessary, smaller stocks should be kept on hand and the oldest used first.

Large tanks should be filled and emptied by gravity, and temperature maintained between 70 and 100 F if possible. Sheet-iron or steel construction is preferred. Galvanized iron should not be used, as the zinc may react with some lubricants.

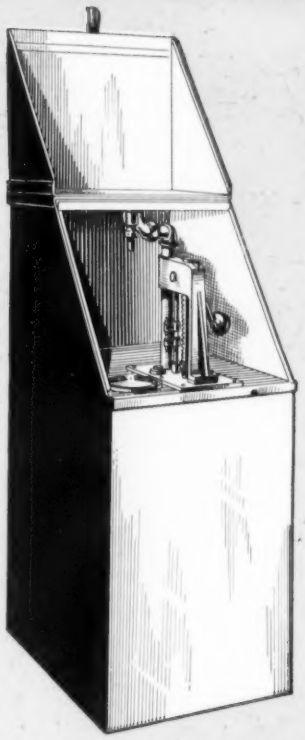
Proper venting of tanks with screened orifices equalizes pressures, and dryers are sometimes used to prevent moisture intake. A sloping bottom with drain plugs below oil-drawing levels facilitates tapping of clean oil. Tanks to be cleaned should be flushed with kerosene, which must then be thoroughly removed before refilling with oil. Cleaning rags and waste kept in fireproof containers and fire extinguishers in the storage area are necessary preventive measures.

Handling

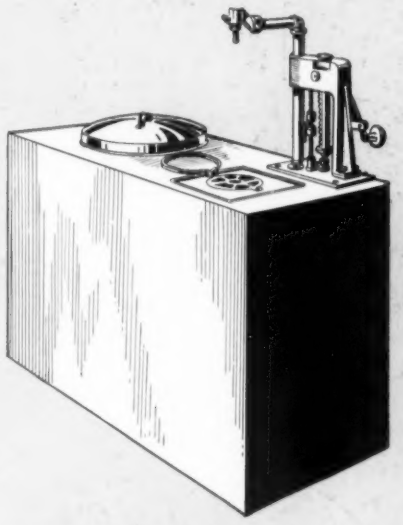
Sealed measuring pumps facilitate delivery of oil from tanks to dispensing equipment and some of them have built-in meters to record amount of withdrawn oil. Such measuring devices lead to improved cost analysis and afford added protection.

Portable tanks, equipped with strainers and pumps, provide safe and convenient delivery of lubricants to machines. They may be located at sub-stations for large machine installations, particularly where operators are responsible for machine lubrication. For smaller requirements, shipping drums, placed on their sides and equipped with barrel-pumping devices or emptied through faucets, can handle small-plant lubrication requirements. Cabinet-type tanks affording contamination-free storage may also be located through the plant at convenient spots. Oiling trucks, equipped with oils, bottle oilers, grease-guns and drawers for oil and grease cups, wick feeds and necessary devices are widely used for dispensing of lubricants to machine installations.

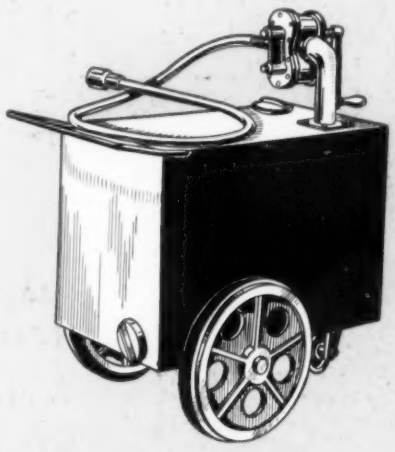
After the lubricant is in the machine in good condition, the threat



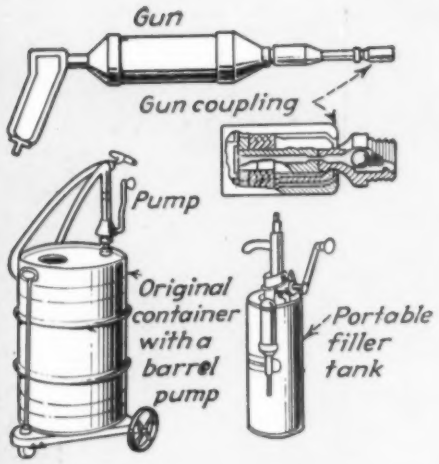
Cabinet-type storage tank



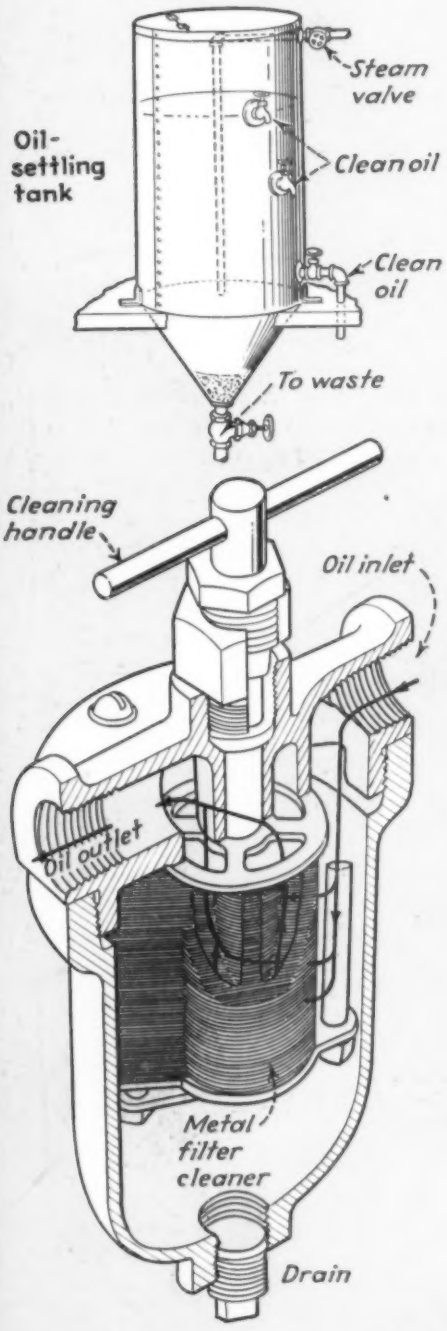
Sub-station storage and dispensing tank



Portable tank two-way pump



Dirt-free dispensing of grease from storage drum to machine tool bearing



Typical pressure-line filter

of contamination is present throughout its service in the machine. Impurities may be gaseous, liquid or solid. It is not economical to throw away quantities of high-grade lubricants after short periods nor is it wise to deliver contaminated oil to precision bearings and gears. Cleaning, during or after service, will extend lubricant life appreciably.

Cleaning Oil

Various methods of cleaning oil include batch, bypass or continuous systems. Batch cleaning, in which contaminated oil is withdrawn from the machine to a cleaning system is the most thorough and removes both soluble and insoluble impurities. In one simple and effective batch method the charge of oil is withdrawn from the machine to a settling tank. As the oil cools insoluble impurities are precipitated and settle to the bottom of the tank, followed by liquid impurities and water. Conical tank bottoms increase self-cleaning capacity. Thin oils give up their suspended matter more quickly than heavy oils and the required settling period may be from overnight to ten days or more.

Some impurities are so light that the oils must first be steam-heated or coagulents added to speed up the settling process. Steam should be added slowly, until the mixture is raised to 180 or 200 F. It is then cooled gradually. Light suspensions are carried to the tank bottom with the water.

Batch cleaning with purifiers is a combination of screening, precipitation, filtration and washing with water. Screening passes coarse contaminants to a fine-mesh metal cloth to prepare the oil for following and more complete purified steps. Heating speeds operations of this type, but the cleaning is not so effective. Final screening is with cotton waste, felt or cloth in larger areas and at slow flow. In most of these systems, the filtering and cleaning elements are removable as units and cleaning them need not hold up the purifying process.

Activated-clay Devices

Purifiers are available which make use of activated clay or Fullers' earth. This material possesses an adsorbent action which is particularly effective in removing oxidation products from lubricating oils with which it comes in contact. However, it is not effective in removing any water present in the oil. Activated-clay devices may be used in batch, bypass or continuous purification of oils.

Some purifiers use the principle of mixing the clay and lubricant in an intimate mass, the mixture then being forced through a filter press to separate the clay from the purified oil. Other purifiers of this type use the clay in the shape of pre-formed cylindrical blocks, through which the oil to be cleaned is forced. Occasionally, clay blocks and fabric filters may be used jointly.

When lubricants are given special properties by the inclusion of chemical materials, giving what are known as additive-type oils, the use of activated-clay devices for purification of the oil must be carefully weighed. This also applies to compounded oils. Certain additives are removed by contact with the clay, and unless make-up requirements are sufficient to furnish continual replenishment of the additives, the lubricant may be deprived of its special properties very quickly through loss of additives. This condition may be aggravated by activated-clay purifiers which use heat to expedite the cleaning process, as it is difficult to avoid overtreatment of the oil in such cases.

A decision to clean compounded lubricants by means of activated-clay purifiers should, therefore, be made only after careful appraisal of all the factors pertinent to the situation. Consultation of both the oil supplier and purifier manufacturer is advisable in this instance.

Centrifugal Cleaning

Centrifugal purification is a mechanical process for accelerating the separation of impurities from oils by rotation at high peripheral speeds, introducing a force many thousand times as strong as gravity. This is a fast-cleaning method employing the precipitation principle for horizontal separation.

Several types of bowl may be used. A common one contains a number of conical plates for handling the oil in thin layers, thus speeding separation. Oil flows upward toward the apex of each cone. Insoluble im-

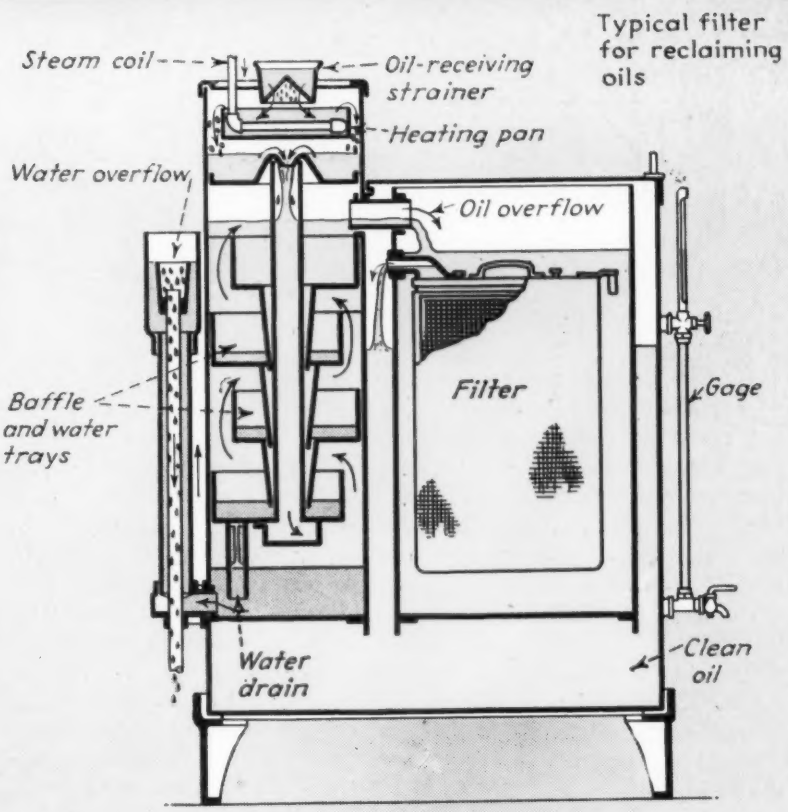
purities separate more rapidly and are thrown in sediment pockets. Water and sludge, being heavier than oil, are forced outward and rise to the lowest discharge spout. Purified oil, after leaving the plates, discharges from the middle spout, a top spout providing an overflow.

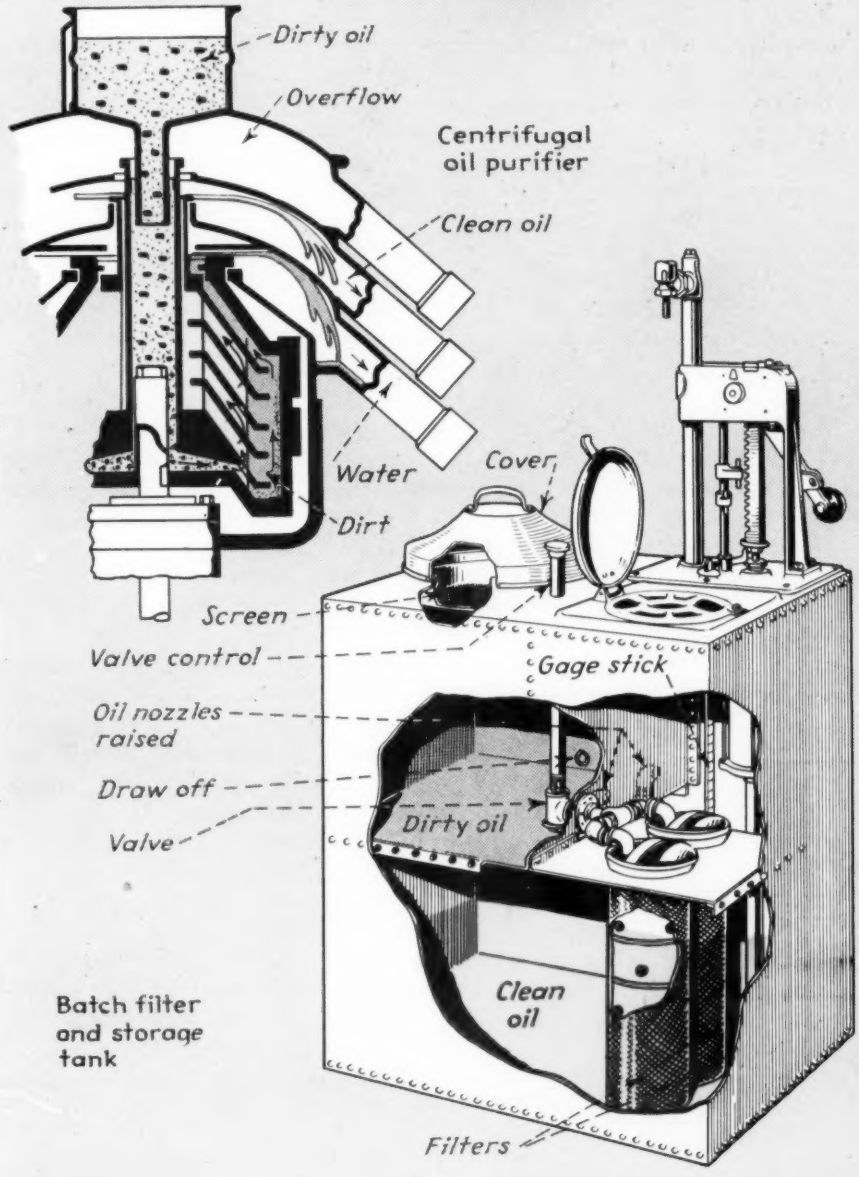
Pressure and vacuum-type filters are readily adaptable to pressure circulating systems on machine tools and gear drives. If the filter is placed in the pump discharge line it is a pressure type, if placed in the pump suction line it is a vacuum tye. These filter units are generally comprised of linen, cotton or wool bags with metal-separators. This assembly is rolled up to fit a metal cylinder. Spring-loaded relief valves bypass oil to the bearings if the filtering elements becomes excessively clogged. Up to a point, however, the sludge increases the effectiveness of the filter. Elements should be washed or replaced periodically.

Line Filtration

One model of filtering unit consists of a stack of round, thin, perforated disks, separated by metal spacers. Thickness of the spacers determines the degree of filtration. Oil enters through the filtering element, passes through small spaces between the disks, flows up through the center to the outlet. A handle-operated cleaning device is built into one type with cleaning blades inserted between each pair of disks. All disks are cleaned at once and sludge sinks to the bottom of the unit for withdrawal. Average pressure drops across such filters are from 5 to 10 psi.

Adequate supervision of lubrication programs demands qualified personnel. A lubrication engineer to analyze requirements for all machine tools and equipment can guarantee sound administration on an economic basis. In addition to analysis of requirements, storing and handling, selection of lubrication systems, oil reclamation measures and standardization someone must be responsible for fulfillment of all instructions and supply data estimating consumption and costs. The lubrication engineer, working in conjunction with the oil company and the machine manufacturer, is the logical man to do such a job.





What's Ahead in LUBRICATION

MACHINE lubrication is now recognized as a production factor, essential to maximum sustained output, decreased downtime and lower power consumption. It is positively regarded and evaluated instead of being treated merely as unavoidable maintenance.

Unprecedented installation of new machines during the war period eventually placed increased emphasis on the necessity of efficient lubrication. Development of cemented-carbide tool techniques, higher machining speeds and feeds, close tolerance work, low clearance, heavy loads and 24-hr. operation made sound lubrication mandatory. Manufacturers, normally loath to invest in quality oils and appliances, showed a greater desire to protect modern precision equipment. As a result, lubrication is receiving the cooperation, attention and research of the manufacturer, oil company and user.

At the present time lubrication of machinery is being closely reviewed and some apparent trends are:

1. Lower Viscosity Lubricants

Responsible in great measure for the trend toward lower-viscosity lubricating oils is the degree of precision machining required. Here the more-fluid oil operates better in low clearances areas and allows less unnecessary way and bearing clearances. Where oil film strength is needed because of heavy pressures it will be provided by suitable compounding and E.P. (extreme pressure) oils rather than by heavy-bodied, high-viscosity materials. This trend will fit in with the design of new machines for higher speeds, lower clearances and higher unit pressures, providing an adequate rate of lubricant flow.

2. Automatic Lubricating Systems

Automatic lubricating systems and devices, as a means of providing measured, adequate quantities of oil to operating bearings, is increasing rapidly. Development of, and greater use of high-grade lubricants makes this logical, as only the better lubricants will circulate long enough to employ automatic systems most economically and efficiently. Hand oiling still serves bearing points which are either intermittent in operation or sustain low pressures and speeds. Here slightly lower quality lubricant will be used as the oil has a one-way trip. The system used to circulate the lubricant and the points to be lubricated will determine which grade of oil provides greatest protection and economy.

3. Higher-grade Lubricants for Basic Mechanisms

Conditions of overload, prevailing during "round-the-clock" war production, first indicated a need for E. P. lubricants in machinery. Tableways and gearing have been particularly affected. When conventional oils showed a tendency to "iron out" under load this specialized type of lubricant became necessary. Lubricating oils, compounded for increased "oiliness," will be in greater demand for thin film lubrication.

4. Extreme-pressure Lubricants More Widely Applied

More recently, machine designers, oil companies and users have been considering wider use of E.P. oils for existing equipment and more particularly for future machines. Its application to grinders for crush dressing and centerless thread grinding, considering the heavy bearing loads involved, is predicted. Geared heads of vertical turret lathes may be another application for these oils.

5. Additives for Rust and Oxidation Prevention

Wider use of automatic lubricating systems, compounded oils, low clearances and faster lubricating cycles indicate that oils treated for greater corrosion resistance and non-oxidating characteristics will be in demand. This will be particularly true of hydraulically operated tools where there is danger of diluting hydraulic fluids.

6. Dual and Triple-purpose Screw-Machine Oils

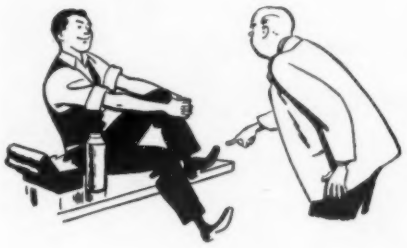
During the war dilution of cutting oil with lubricating oil has impaired machining operations greatly. This has been particularly true on multiple-spindle automatics and has led to experiment with dual and tri-purpose lubricating oils. One oil for hydraulic, lubricating and cutting purposes is now being tested in service on chucking automatics. It has been estimated that about 80% of machining jobs can be handled satisfactorily with this type of set-up, some of the tougher metals requiring a more active type of cutting oil which would be incompatible with hydraulic and lubricating systems. The practical application of dual and tri-purpose oils is an arbitrary one and is questioned by some leading petroleum companies. Much work and experiment is required before this development will come of age.

7. Diversified Requirements

During the war many new types of equipment and machinery have added lubrication requirements which did not exist previously. Many of these requirements will be carried over to civilian production and possibly increased. To meet these new requirements the oil industry has developed many special-purpose lubricants. As a result of this much valuable knowledge on the effect of additives has been gained and is now at the disposal of industry. A rapidly increasing list of chemicals is broadening the potential characteristics of lubricants to meet new industrial demands.

Oil control charts and other means of ensuring timely application of the right lubricant is slightly increasing despite the trend to automatic and measured lubricating systems. Recognition of the importance of lubrication in maintaining production is bringing qualified personnel to that department. This in itself will be a guarantee against deterioration of equipment through faulty lubrication.

ROUND TABLE



Pay for Suggestions?

"SO THAT great idea man, the toolroom foreman, doesn't think ideas are worth a percentage of what they save, eh?" challenged Al, parking on the big surface plate and settling down for an argument. "Patriotism was a reason for going whole hog in rewarding people who made suggestions, but cutting a healthy slice off production costs, now that the war is over, doesn't interest you, I suppose."

"Al, you sound like somebody on a soap box," grinned Ed. "You're really wasting your time around here. If I had a suggestion blank handy, I'd suggest that shop foremen stay off my best surface plate. That idea ought to be worth a sawbuck to the company. I'll pass up that chance for easy dough, though, if you'll give me a sensible way to figure the value of an idea like that—one that avoids trouble or inaccuracy, or reduces accidents, or some such thing that isn't saving some exact number of hours."

"You mean, Ed, your real worry is for the guy who thinks up a non-productive idea? Is that why you think the whole suggestion-award plan is cuckoo? Well, you put a price tag on your own idea without any trouble. I'd guess a committee could make a pretty fair series of guesses the same way."

"You mean by taking a vote on how much it's worth to put a rail around a pump pit or hang a lantern on a low beam? Sounds to me like you're just agreeing with my idea of token awards—a five-spot or a war bond to show the guy's interest is appreciated."

"For that kind of an idea, Ed, I can't see that there's much else to do. But an idea that cuts shop time on a job can be figured out exactly."

"Yeah, Al, if you can take off costs of the change, of making a checkup to see how much it saves, and of being sure the right guy gets credit. There's always the boss who has to improve or cooperate so he gets his cut, or the boss who says the idea isn't any good because it's old, or who takes a guy with ideas and puts him on salary in the development department so his ideas can be called part of his job."

"Nuts, Ed. You never can be sure you've got all the bugs out of anything. There's always some chiseler looking for a soft touch or some guy trying to do the company a favor. The important thing is to give the guy who goes out of his way to cut costs a share of what he saves."

"What's your idea of how to do that, Al? Want the idea man to wait until the company can see how much his idea saved? Or have the boss hand him a personal reward?"

"No, Ed. I'd make a flat payment right away if an idea is usable. Then added payments can be made as savings mount up. Or maybe they can offer a flat payment if the suggestor chooses."

"What if he quits or is fired, Al? And what is a fair value?"

WHAT is more important, credit or award for a suggestion? How can non-productive, but valuable, ideas be paid for fairly? How should an award committee be made up? How can proper payment for productive suggestions be determined and paid? Should there be a top limit? Your answers to these and other questions will be appreciated, and those published will be paid for

Maximum flexibility for induction-heating work is obtained by using two 400,000-kilocycle generators, which can be combined by the upper panel switch. Four work stations are arranged on the panel, two for each machine. Switches on each of the end panels make possible operation of the two stations alternately

Induction Heating
CAN MAKE MONEY
On a Job-Shop Basis

If they own flexible equipment, plants can do induction heating work for others on a short-run or experimental basis, reports Chester Ricker, Detroit Editor

BRAZING is one of the most promising applications of induction heating. This method of making assemblies is helping many manufacturers produce better parts at less cost, because it can be set up on an automatic production basis, is fast and simple, gives precise control of variables and requires inexpensive fixtures. But the equipment usually represents a heavy capital expenditure, making the cost per piece prohibitive unless ample production is available.

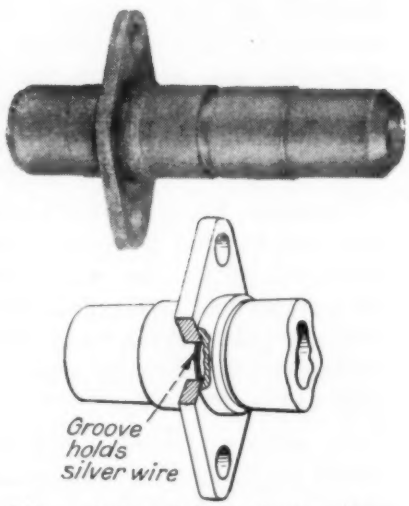
This situation presents an opportunity to the plant that installed induction-heating equipment during the war and now finds that open time is available. According to Rex Baubie, induction heating engineer, the Central Boiler & Manufacturing Company's Induction Heating Division, Detroit, induction heating can be done profitably on a jobbing basis.

During the war the induction-heating division operated 24 hours a day—running on short jobs during the day and production runs at night. This made it possible to establish setups that did not have to be torn down by night-shift operators. It also provided maximum utilization of the induction-heating equipment.

Since the war the shop has been getting two kinds of business: (1) parts used in small production runs, or small job-lots of non-repeat parts, and (2) an entirely new type of business—experimental runs.

Costs for Heating

The first type of parts require a fixture and inductor coil. Both of these can be made for repeat runs with minimum setup time. Non-repetitive jobs must pay for tooling. To simplify accounting, it is the practice in this shop to charge for the fixture and inductors separately, and then for induction heating on an hourly basis. Inductors cost from $15 up. Fixtures vary from none required to fairly elaborate units for repeat work. The cost of operating the equipment varies from $15 an hour up, depending on the amount of power required.



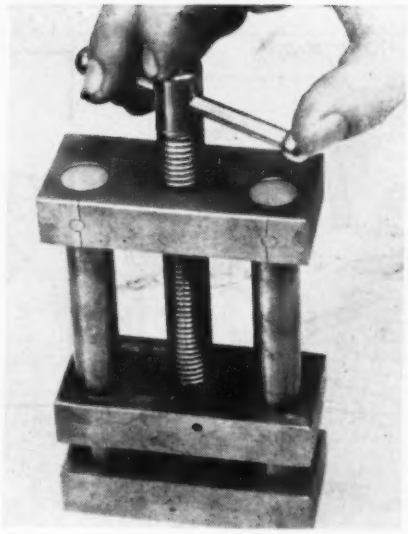
When designed for induction brazing, assemblies are better and cost less to make. Formerly, this flanged bearing was cast iron, machined all over, but rejects were high by reason of porosity. New design consists of screw-machine part for bearing, stamping for flange. Before assembly, a silver-solder ring is slipped into the bearing groove and the flange slipped over it and into position against the shoulder

Customers asking experimental runs are growing in number. Induction heating in big manufacturing plants is frequently installed in a production line and operated with a high load factor. It is not economical to tear down setups to try out the production of a new part. For that reason many big manufacturers send their metallurgist or product engineer with parts to be induction-brazed or heat-treated experimentally. They arrange beforehand for the use of the equipment for short runs until they determine operational time and costs. At present, a large portion of the daytime "job work" is of this experimental nature.

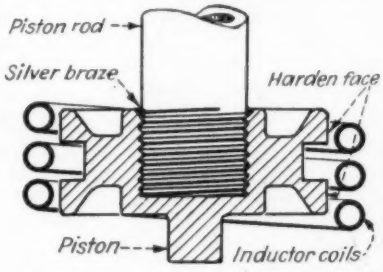
Ease of Setup

To the "job shop" man, the inductors or heating coils can be changed in the machine as readily as the drills and reamers in a drill-press. Jigs and fixtures are not elaborate and can be interchanged just as easily as the heating coils.

Brazing with silver alloys is old. Today, more than a dozen silver alloys are in use. They have one common characteristic: they join metal parts without distortion, as their melting points range from 1100 to 1600 F., which is below the critical temperature of most parts to be brazed. The alloys flow freely and only 0.001 in. clearance is needed between the parts to be joined. Contact surfaces of the parts are prepared with flux and the brazing alloy applied as pre-cut pieces of wire or flat stock after the parts are assembled. Then it is only a matter of seconds to heat the joint to the proper temperature by induction heating.



When this machinist's vise was assembled, the steel top member cracked when the uprights were pinned. When joined by induction brazing, no pins were required, so no further cracking occurred



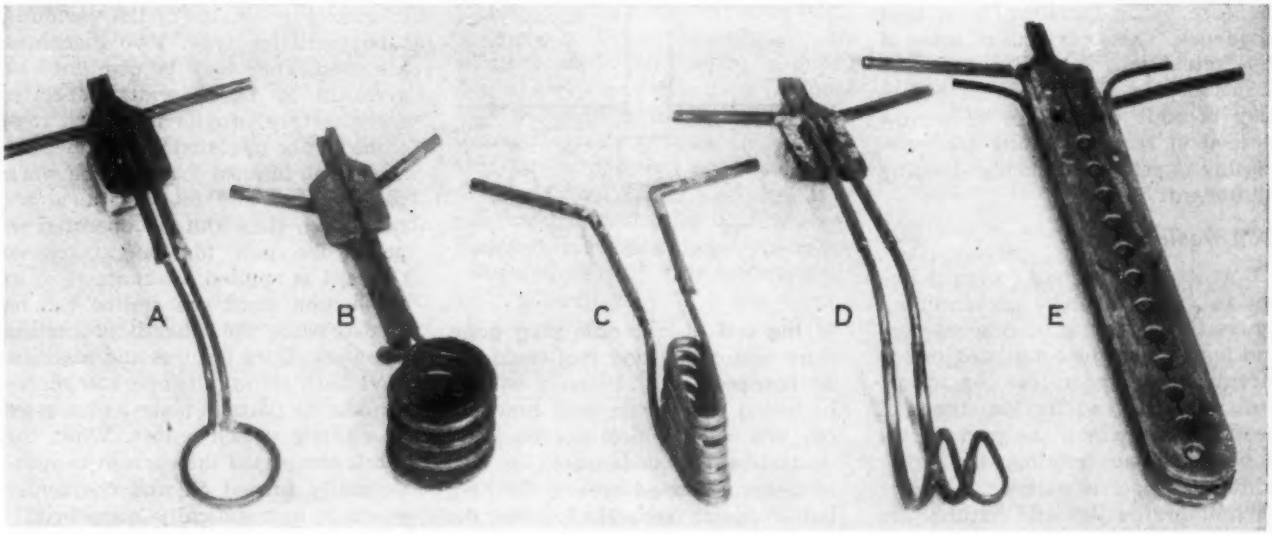
Brazing and hardening in one setup. Here the piston and piston rod for an airplane hydraulic jack are securely assembled by silver-brazing the threaded joint while the outside diameter of the piston is hardened

Temperature, time and amount of brazing alloy used are the elements of the process and all are accurately controlled with induction heating Timing can be varied from 1/60 sec. to 5 min. with the equipment used in this shop. Depth of penetration can be checked by examining one test piece, and once established it is constant. Hardening or annealing can be combined with the brazing operation, using simple fixtures to meet special requirements.

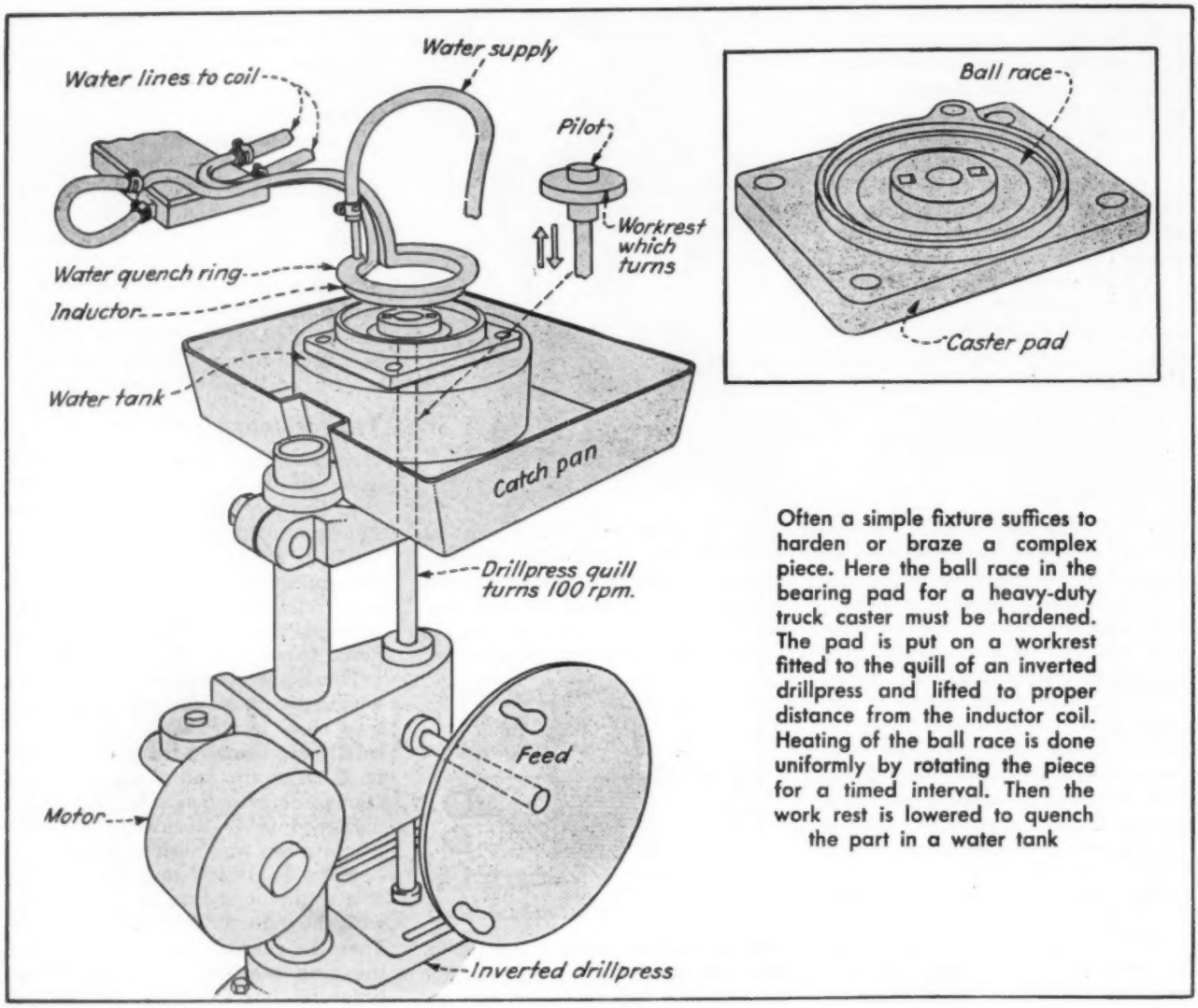
Typical Jobs

Some of the jobs that have been done in this shop are: making built-up eccentric shafts, attaching shanks to drills and reamers, fastening lugs to hose clamps, attaching high-pressure hydraulic pneumatic and refrigerator coupling fittings and applying carbide tips to cutting tools. Other jobs are illustrated.

There are some hardening tricks which cannot be done in any other way than by induction heating. A small ring about ⅜ in. in dia., 0.040 in. thick on the end of a gage, made from a high-carbon steel had to be hardened to 43 Rockwell C. If the whole piece was hardened, the ring became too brittle and cracked off. It was immersed in a water bath with the inductor coil also immersed. Then the current was applied. When the ring reached the proper temperature, current was cut off. At that instant it was still insulated by a skin of steam, which was almost instantly washed away by the sur-



Inductors are readily changed for different jobs. The purposes of these inductors are: *A*—to anneal the portion of the internal surface already hardened; *B* and *C*—for rod and flat stock, respectively; *D*—hair-pin inductor used to harden grooves in twin-groove pulley (rotated during operation); and E—multiple-coil inductor used to harden the threaded portion of ten screws simultaneously, leaving the heads soft



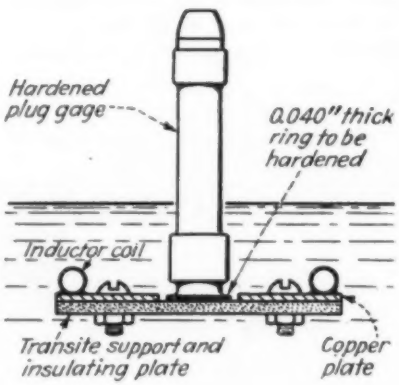
Often a simple fixture suffices to harden or braze a complex piece. Here the ball race in the bearing pad for a heavy-duty truck caster must be hardened. The pad is put on a workrest fitted to the quill of an inverted drillpress and lifted to proper distance from the inductor coil. Heating of the ball race is done uniformly by rotating the piece for a timed interval. Then the work rest is lowered to quench the part in a water tank

rounding water. This chilled the piece so rapidly that the austenitic structure was not lost as would be the case while handling from heat to quench. This is typical of some of the "pilot" jobs solved in this "job shop" for big manufacturers before they commit themselves to a new method of making a part and purchasing expensive induction-heating equipment.

Coil Design

Correct inductor coil design is important. It involves determining where the heat is to be concentrated and how it may be conducted to adjacent members in the operation. Coils are designed for two types of heating: one where the part is stationary during heating, the other where the part is moved.

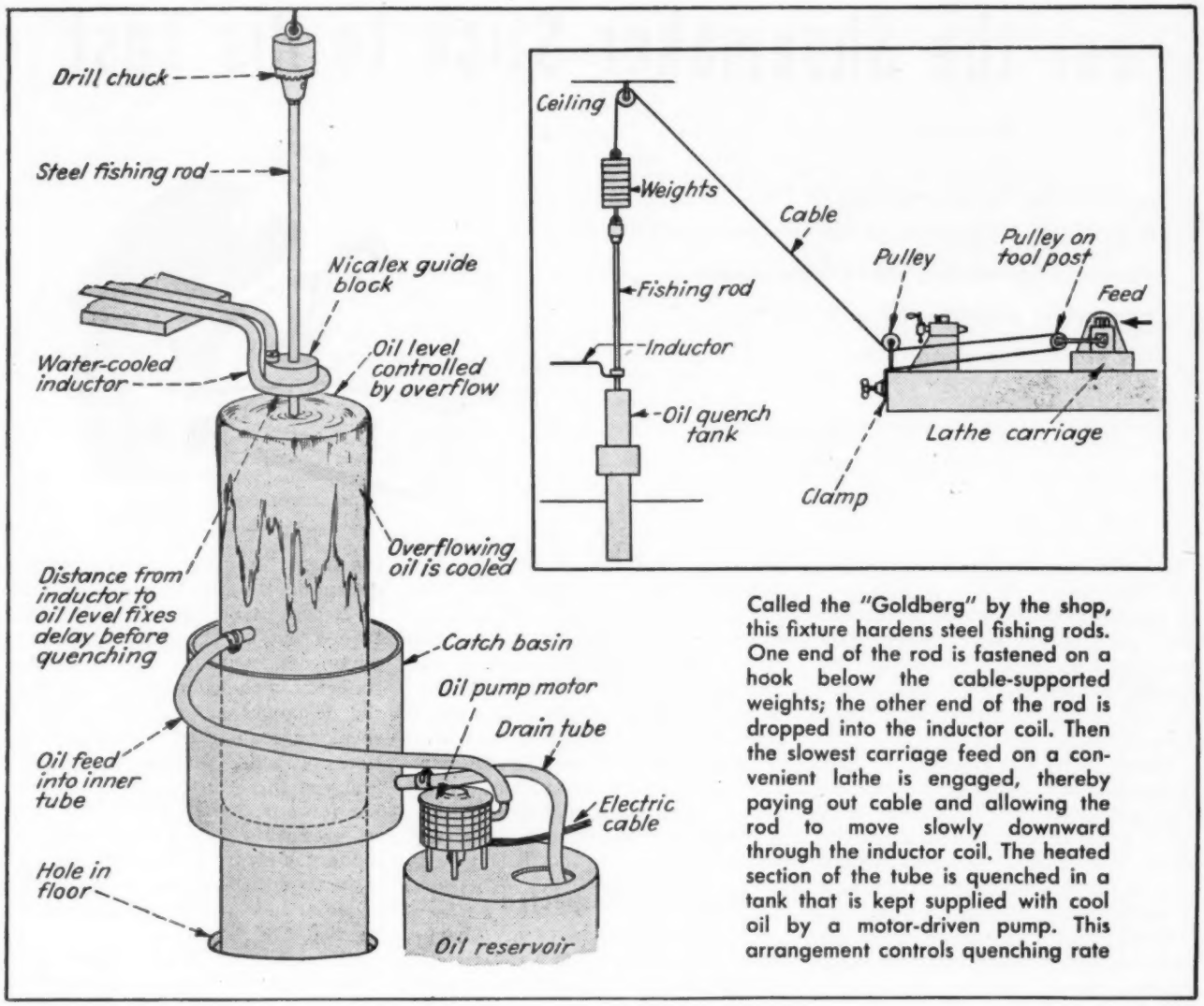
Whether the jigs and fixtures are manual or automatic in operation depends upon the size of the job. Most job-shop business is in small runs, sometimes repeated later, and automatic fixtures would cost more than the time saved would amortize.



At the end of a certain plug gage there was a thin ring that could not be hardened conventionally without becoming too brittle and breaking off. When the critical portion is induction-heated underwater, a film of steam is formed around the ring, but dissipates immediately when the current is shut off. The water then quenches all portions of the ring uniformly and cracking is avoided

For "job shop" service this company prefers a 400,000-cycle, high-frequency generator of the vacuum-tube oscillator type. Two machines are used. They may be combined to give up to 42,000 watts capacity. Switches are provided so each machine can be operated independently, as is done in most jobs. On the work panel there are four stations arranged so they can be operated in pairs, one pair for each machine. Current is applied alternately, so in production work one station can be loaded while the other is processing the work. Once fixtures and machine have been set up, the operator merely puts the parts in place and presses an electric switch button. When the job is completed the current is automatically turned off and frequently work is automatically quenched.

Two types of automatic timing controls are used—one an "ATC" clock device which controls cycles that take minutes and seconds; the other is a Weltronic switching con-



Called the "Goldberg" by the shop, this fixture hardens steel fishing rods. One end of the rod is fastened on a hook below the cable-supported weights; the other end of the rod is dropped into the inductor coil. Then the slowest carriage feed on a convenient lathe is engaged, thereby paying out cable and allowing the rod to move slowly downward through the inductor coil. The heated section of the tube is quenched in a tank that is kept supplied with cool oil by a motor-driven pump. This arrangement controls quenching rate

trol, operated by vacuum tubes and condensers, that does two things: times the current flow to 1/60 sec. and times the interval before quenching starts. This device takes guesswork out of heat-treating small production parts. The transformers are placed on a shelf immediately behind the inductor connection and can be shifted or combined with ease to provide for special conditions.

Oscillator

The oscillator was chosen with a range that gives maximum utility. The major portion of the work to be handled does not require deep-heating such as is obtained with lower frequencies. To explain this, reference is made to the table giving depth of penetration for induced current of different frequencies. An interesting phenomenon is shown in this table: namely, that the depth of penetration of induced current in steel varies with its temperature. Penetration is 30 times as deep when hot as when cold. This effect apparently does not hold true for copper, aluminum and brass.

PENETRATION OF INDUCED CURRENT IN INCHES

MATERIAL	KILOCYCLES			MEGACYCLES		
	10	100	400*	1	10	100
Steel (cold)	0.008	0.003	0.0012	0.0008	0.0003	0.00008
Copper	0.025	0.008	0.0039	0.0025	0.0008	0.00025
Aluminum	0.035	0.012	0.0055	0.0035	0.0012	0.00035
Brass	0.055	0.018	0.0088	0.0055	0.0018	0.00055
Steel (hot)	0.240	0.075	0.0370	0.0240	0.0075	0.00240

This table appeared in "Practical Aspects of Induction Heating," by W. M. Roberd, published in *Metal Progress*.
*Interpolated in Roberd table to the range of the induction-heating equipment used in this shop.

TIPS for Top Shop Men

14 Choose assistants for their supervisory ability, not just for technical knowledge. Other things being equal, the best leader is the natural one—the man the others instinctively follow. Use his talents.

15 Train everyone for advancement. Teach every worker capable of learning how. Show them other operations, other jobs, how to set up their own and other work. The foreman who trains somebody to take his job won't be pushed out—he'll be pushed up.

16 Define authority and responsibilities of every one working for you and back up that authority. Hazily defined responsibility leads to contradictory instructions, confusion and lowered morale. Don't countermand assistants' orders to "show who's boss"—or countenance evasions by anyone.

Let the Shoemaker Stick to His Last

. . . and the design engineer to his.
In which we take issue on certain points with "Product Engineering," to DDT the spread of competition between the engineering and production departments

BY E. J. TANGERMAN
MANAGING EDITOR

"IT AIN'T the things we know that are dangerous," old Abe Martin used to say, "It's the things we know *that ain't so.*" I am reminded of this hunk of Hoosier philosophy by the leading article in the November issue of our companion publication, *Product Engineering.*

Titled "Why the Engineering Department Must Specify Production Methods," it reports interviews with more than 30 design executives to show how they influence adoption of new manufacturing processes and to support the claim in its title.

Now *Product Engineering* is an alert and progressive technical magazine . . . in fact, the best in its field. We are proud of it; nay, we are doubly proud because, as many of you may not know, this lusty young oak began life as our acorn. As a proud and self-respecting parent, however, we feel impelled to take hairbrush in hand occasionally, or at least to wave an admonitory finger.

"Know" Is Better

All this wouldn't have happened, perhaps, if the title of *Product Engineering's* article had been, "Why the Engineering Department Must *Know* Production Methods." Yes, we would have cheered, aided, abetted this premise, for it is a rigid requirement in top manufacturing plants. But *"Specify . . . "*! That and the supporting article are open to considerable argument.

Now let us take up the matter of the supporting "survey." We know the 30-odd design executives who gave their opinions are men of highest calibre. But who ever heard of a Congressional issue being solved by agreement among Republicans alone . . . or Democrats alone? There are two general types of survey, the inductive and deductive. In the first type, you start with as accurate a cross-section of the people involved as possible, then summarize their opinions and draw conclusions. In the second, you begin with a point to be proved, survey a group likely to agree with that point, and report their opinions to substantiate your claim. I maintain that this survey of design executives only is of the second type.

Engineers are Respected . . .

As an engineer (says my sheepskin) I have the utmost respect (as do most production men) for intelligent, cooperative engineers. But articles such as this one are very likely to encourage over-aggressiveness on the part of immature designers and to fester the ill-conceived cut between production and engineering. For instance, here is what one veteran production man, nationally known and with 50 years of experience back of him, said when he read this article:

"The engineering department is on the rampage again. The bright lads who design the machines and equipment demanded by the sales department to catch the eye of the buyer now want to tell the men responsible for production just what machines and methods to use in making them. In short, the engineering department wants to run the plant.

". . . not the slightest idea . . ."

"Recent experience with designs turned out by the engineering departments of some of the largest concerns in the country indicate that the designers did not have even a speaking acquaintance with production methods, ancient or modern. Some of these designs are responsible for our being over a year late in producing some implements of modern warfare. The engineers in these cases had not the slightest idea of how their monstrosities were to be made.

"If designers were experienced production men as well, it might be possible to eliminate the production department and have the designs carry full instructions for shop foremen. But designers of this kind are few and far between. As it is, it would save a lot of time and money if every designer had to spend a year or more in the shop before doing any designing. Lack of shop training is responsible for much of the delay and expense in producing new designs in most shops.

. . . Even Appreciated

"All good production men appreciate new and interesting designs. Few of them claim ability to originate designs for the intricate equipment they build. But when the responsibility for economical manufacture is put in the production department, where it belongs, they devise ways and means which few designing engineers ever saw or heard of.

"The most successful concerns do not give either engineering or production departments absolute control of their product. They have found that teamwork wins. Before

designs are frozen, the production man gets a chance to suggest changes which will facilitate manufacture. For example, it is frequently better to make a part in two pieces instead of one on account of machining methods of which the designer knows nothing. In the case of one of the war jobs mentioned above the building of a rotor of a series of disks would have saved much money and *time*, which was much more important. Instead the production man had to build special devices for an almost impossible operation, of which the designer knew nothing. This delayed production until after the war was over.

"Top management must decide whether the new product must be made on existing equipment or if costs will permit the securing of new standard or special machines for the work. Top management must also decide whether economies suggested by practical production men, or expensive methods made necessary by the designs of engineers who know nothing of production, are to be used. Nine times out of ten, the management which makes production men responsible is most successful.

"Even in designing tools and fixtures, where the designer usually comes from the shop, the most successful concerns consult the foremen, and frequently the operator who is to use the tools, before the design is finally selected. The great mistake of the Taylor system was in assuming that all the brains were in the planning department. We may some day have a breed of designing engineers who can successfully decide on the best production methods, but over fifty years of intimate contact with modern industry indicates that this millennium has not yet arrived."

No Proof

I am certain it would have been easy to get a similar opinion from 29 more production men, and thus to match the *Product Engineering* survey man for man, but it wouldn't prove a thing. The author of the preceding opinion would himself be the first to admit that Engineering has its place, and a mighty important one. But it gets his dander up to think that a smooth-running, skilled, cost-and-time conscious shop should be at the mercy of visionary sliderule pushers.

Design engineers naturally would like to control production, just as production executives frequently express the desire to control design. And both resent the efforts of sales and purchasing departments to dictate. It's all part of the great American habit of sticking our noses into the other fellow's business, and taking a swing at the other fellow's nose when he sticks it into ours. All of us believe we are better qualified for the other fellow's job than he is.

We agree with the contention in the article under discussion that technical design, materials and methods are interdependent and determine functional quality, cost and salability. We disagree, however, with half of the statement that "because these three factors are inextricably interlocked, the responsibility and the authority to specify both materials and production methods must be vested in a single office or an effective committee." A committee including Engineering, Production and Sales can do the job, but any single office attempting it smacks of dictatorship.

"...millennium has not arrived . . ."

Delicate Distinction

Perhaps the distinction is delicate. Most committees are dominated by an individual, it's true, and the man with most brass or closest to the administrative ear may influence its decisions. But at least it provides an opportunity for expression of opinion. It gives the sales executive a chance to suggest methods or designs that can become sales points, the engineer a chance to suggest methods or materials that may be strange and new, the shop man a chance to suggest less-exacting tolerances or cheaper methods through slight redesign. The group works together toward a common goal.

Lopsided control must have been the reason for such designs as the streamlined "teardrop" lawnmower, the tricky and fragile materials in places where they should never go or before their potentialities are understood, the automotive designs that put a stoplight switch inside the oil pan, or take a contortionist to get into or see out of, the machines that take an octopus to run. There are dozens of other examples, but none can be assessed against a committee, we'll wager. Somebody must have made a big-shot decision.

Another Disagreement

But let us get on. Another paragraph is headed, "Engineers Must Select Materials," and concludes, "Only the engineering department is equipped with the talent and data required for an intelligent selection of the possible materials of construction. And because every material has widely different workability characteristics, the material specified determines the manufacturing processes that can be used economically."

Because I agree with the second sentence, I disagree with the first. What if the engineering department specifies a material that won't draw to the required depth, or is difficult to machine, or creates unnecessary complications in assembly? Must the production department struggle along, because "the talent and data required for an intelligent selection of the possible materials" is all in Engineering? Maybe in this case the talent and data need a practical supplement.

A vital point made by our companion publication is that the designer should not be restricted in his design by equipment available in the shop. Any shop worth its salt should be able to compete successfully with outside sources for jobs it can handle and be willing to let them go outside if it can't handle them. By the same token, it should enjoy similar freedom in selecting equipment to handle each job. If new equipment is needed, even totally new processes, Production should have the opportunity to present a set of figures. Further, it should have "first refusal" on a proposed production assignment. The *Product Engineering* survey indicates that in 21 of the 30 cases studied "the engineering department specifies production method regardless of the shop equipment available. In every case the production de-

". . . a streamlined 'teardrop' lawnmower . ."

partment is free to suggest a new or different method, but as one chief engineer expressed it, 'The engineers consider it a black mark if Production suggests a new method that Engineering has not already studied and considered.' "

Why a black mark? Because, as the article continues, "Production men do not follow the new manufacturing processes as well as do the engineers"? Or again, that "the engineering department knows more about relative costs than does the production department"? As the article suggests, "Many production men will vehemently disagree." Partly because neither the statements nor the reasons have any foundation in fact, but, more importantly, because they smack of the engineering smugness that is a major factor in that old and bitter feud between shop and design office. Let's just digress a little to examine that problem.

Coincidence

By peculiar coincidence, the title of "engineer" is applied in the metalworking industries largely to a white-collar group in the engineering department, regardless of individual training or ability. Let's assume that one of two comparable men graduated from the same college with the same degree enters the engineering department of a given company while the other enters the production department. Let's assume further that both are successful and stay with the same company. *The man in engineering will have a series of titles all involving the word "engineer"; the production man will probably never have any that do.* His titles will be asst. foreman, foreman, asst. supt., supt., general supt., production manager, works manager, etc. To all intents and purposes, he is not an engineer. And frequently he comes to visualize a gulf between himself and design engineers, a gulf between the theoretical and the practical.

This occurs for many reasons, among them rigid departmentalization, restrictions on responsibilities

"... most critical is the first year or two ..."

"... a windproof umbrella ..."

or duties, natural rivalry, smugness, and plain egotism. Most critical period is the first year or two, when the neophyte engineer may feel that his degree places him a cut above men who work with their hands. Unless that idea is firmly knocked out of his head, it influences his entire career. Shop men are sensitive to that attitude. If they detect it, their resentment is lasting.

I can perhaps illustrate this situation best by my own experience. While I was serving my apprenticeship, I made the mistake of kidding a young engineer. We were erecting a 6-in. I-beam about 30 ft. long vertically to carry limit switches for an hydraulic accumulator. When we bolted it into place, its top tilted about 2½ ft. Nettled by the superior smile of the watching engineer, I asked him how big a wedge to cut off the bottom to make it set straight. He departed for his tables and slide rule. Meantime I used the timeworn ratio method: X in./30 in. = ½ ft./30 ft. and got a torch to take off the needed ½ in. When he came back with the answer, the job was done—and I was a marked kid. A few days later, he bawled the daylights out of me for not following his drawing in making a part —and said flatly: "I'll do the specifying; you just do the machining." The fact that his tolerances were too rigid and that my liberal interpretation of them saved time and money made no difference.

5-In. Freeze

His next design was for sockets and pivot pins for a jib crane. The socket hole was specified as 5 in.+ 0.005—0.000, the pin as 5 in.+0.000— 0.005. When the crane was up and the sockets riveted in place, the crane beam froze. When Hell started to pop, the machine-shop foreman substantiated my claim that both pins and sockets were within drawing tolerances—all exactly 5.000 in.

A few days later, when I was taking a finishing cut on a spindle for a sensitive drill, the engineer passed through. With a "Why don't you take a real cut!" he turned in the crossfeed to produce a real chip—and ruined the job. I put my calipers in my toolbox, closed it, and started for my coat. The foreman supported my statement that in touching my machine the engineer had in effect taken over my job and stormed down to the supe's office. We got a new engineer—and I hope the former one learned a lesson he'll never forget—that even an apprentice has his rights.

Old-timers will enjoy several extreme yarns along the same line in a recent book.* It is a biography of the inventor, A. J. Musselman, written by his son, M. M.

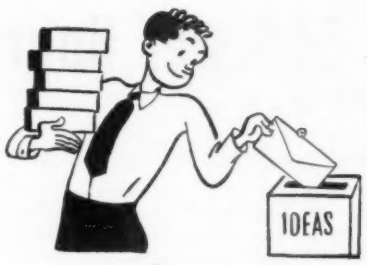
"A. J." was a typical inventor, always trying some new kind of gadget. Most of them don't work, or didn't sell, but he made a living out of the few that did. He tried a single-wheel sulky, a bicycle with wings and propeller, a windproof umbrella (it was—but a woman couldn't keep from taking off with it), a "safe" hammock, an alarm clock to open drafts on the hard-coal heater, an automatic cradle rocker, various unsafe kinds of fireworks, a pneumatic and adjustable bosom, a convertible three- and two-wheeler cycle, a mechanics' hand soap, a pneumatic bumper for autos, a two-speed coaster brake and countless others.

Some Were Practical

But he also invented a first-class coaster brake that went on over five million bicycles, a game called "Parlor Golf" which he sold to Parker Bros. for $100, several popular golf balls and clubs, the zipper golf bag and the balloon tire that took the roughness and shock out of airplane landings. And all this on a fifth-grade education. He fought continually with engineers whose superior knowledge convinced them that he didn't know what he was talking about. His son reports some of his father's milder comments as: "Engineers! They know trigonometry and calculus and chemistry and physics; they know everything in the world, but they haven't got any brains! . . . They won't pull their heads out of the books. They can't see the facts for the figures. They talk about the square of the isosceles, multiplied by the cotangent, divided by the hypotenuse! If I listen to them, we'll end up with a tire that will look great in the Smithsonian Institution but won't work on an airplane!"

But A. J. almost knew too much himself on one occasion. He had in-

*"*Wheels In His Head,*" by **M. M. Musselman.** *Whittlesey House,* 1945.



". . . how to do a job better . . ."

structed his shop foreman, Mike, to test various new alloys for coaster-brake shoes. He had been using a bronze shoe against a high-carbon steel hub. Mike showed him one shoe that had been coated with chromium by mistake. A. J. snorted impatiently and explained that chromium was one of the hardest substances known. It would certainly withstand friction, but for this reason could not act as an effective braking surface. But he permitted the test.

Test results were phenomenal. Then he had the uphill job of selling his customers' engineers on the idea. They explained about friction coefficients and the theory, said it might work in laboratory tests but never in practice. So he had three boys pedal bikes with different brakes from Cleveland to Chicago—the chromium shoe was the only one that lasted. Then they agreed to equip a thousand bicycles and check the number returned for service in a year. Says the author: "None came back. The engineers shook their heads, but at last they were convinced."

A Familiar Story

This kind of story, in various forms, is of course a familiar one to all of us. My first boss, also a lifelong inventor—and a fifth-grade graduate—has had the same experience many times. He has often laughingly commented that he doesn't know enough to know something can't be done. Furthermore, he points out that all an engineering education seems to provide is the reasons why something worth doing won't work.

The net result of his "ignorance" is a series of patents on obviously "impossible" ideas. There is the railway-car end with corrugations which go around the corners. The engineers spent months preparing a report to show it couldn't be done—only to have their report confronted with a fabricated sample.

There was the "equalizer" of scrap I-beams with which two electric cranes of different hoisting speeds successfully handled a heavy hydraulic-press platen. Though it was made by rule of thumb, calculations by the doubting drafting room showed it has exactly the expected safety factors.

Then there were the gun shields which "couldn't be made" on anything less than a 2500-ton hydraulic press. But they *were* made—and on a 150-ton crankpress. And there was the copper-bearing steel that mustn't be heated over 1800 F. Metallurgists said it was hot-short above that temperature. After half a dozen trial sheets tore, the shop crew decided to shoot the works and heated to a nice bright cherry as usual. Results were as usual too-excellent forming. It turned out that the sheet actually was cold-short, contrary to the statements of metallurgical engineers.

Henry Ford had as standard policy the assigning of someone "who knew nothing about the job" to each development project. His results were very successful—even on the evolution of a radically better pipe organ for the chapel in Greenfield Village.

These are Typical

I mention all these cases because they are typical of the experiences of many practical men with one brand of engineer. They are also typical of the management reasoning that discourages shop suggestions because the company has an engineering department "staffed with competent engineers paid to develop new ideas."

No one man nor any group has ever had a monopoly on ideas, even in a specialty. Frequently, the non-professional man or woman shows the professional how to do a job better—because he's far enough away from the problem that his perspective allows him to see the forest instead of the trees.

This is just a plea that we distinguish between education and intelligence; that we keep constantly in mind that the butcher may have ideas for the doctor, or the postman for the engineer. We'd have had iceboxes for heat-treated dural rivets long before we did if engineers had not pooh-poohed the shop report about rivets that worked after being left on a window sill through a cold winter night.

We'd never have won World War II—or at least never have won as quickly—if it weren't for the thousands of suggestions made by "green" hands for simplifying or improving accepted shop operations,

Modern materials and techniques have done much to bridge the gap that once yawned between engineering department and shop, however. It is no longer possible to tab this individual as a production man and that one as a designing engineer. The successful designer must also understand production and sales, or his design will be faulty. The production man must know engineering and sales, or his operations may be too costly. Thus, of necessity, the dividing line between theory and practice must be less sharply drawn. We see that step being taken in the development of service staffs or departments, each specialized and trained to handle a particular functional problem wherever it occurs. In addition to technical background, such staffs must have the skill, and the wit, to win cooperation from the departments they serve.

". . . committee of Production, Engineering, and Sales . . ."

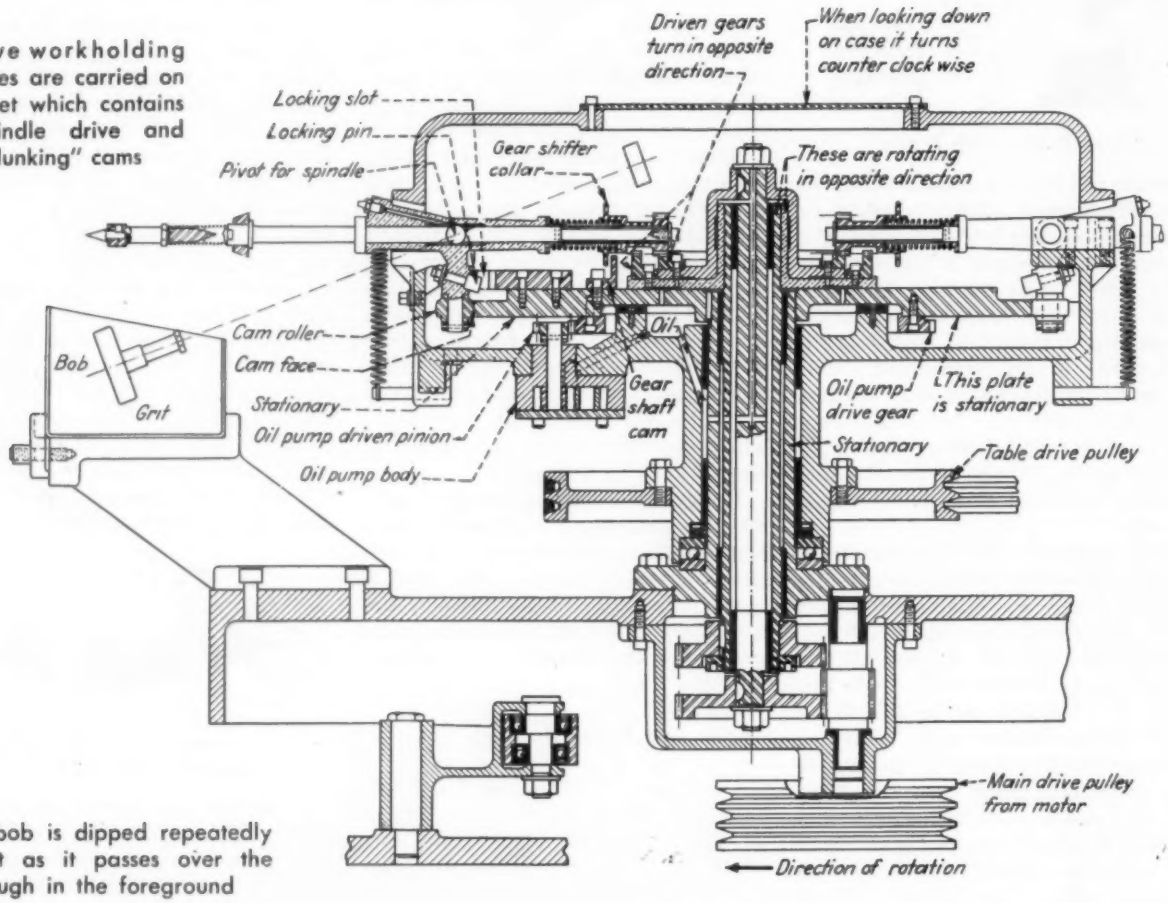
A further development is the committee of engineering, production, and sales executives who cooperate in solving mutual problems and consider suggestions for modifications in designs or methods. Here are ironed out the differences in opinion, the artificial distinctions, the efforts to grab control. The system is being successfully used in many companies—wherever the men who comprise the committee are big enough and broad enough to allow anyone to offer a suggestion in good faith.

The Present Need

This indicates the need for broader training in engineering, in the practical application of ideas as well as in their evolution. The graduate engineer must have all the theory he can master, plus the practical training to apply, or at least understand the application of, his ideas. He must, most of all, have an open mind, willing to consider the ideas and theories of anyone, whether or not he wears a white shirt or has the proper degree after his name. We must break down the last vestiges of the wall between theoretical and practical knowledge, merging the two for mutual benefit and without suspicion or condescension on either side.

'Bobs' Recoated Automatically at 500 Per Hour

Twelve workholding spindles are carried on a turret which contains a spindle drive and "dunking" cams



Each bob is dipped repeatedly in grit as it passes over the trough in the foreground

THOUSANDS of aircraft-engine parts must be carefully polished with cloth, canvas, felt and leather "bobs." Average daily consumption of these at Nash Motors, Inc., Kenosha, Wis., was about 4000. They varied in diameter from 1 to 2½ in. Instead of buying thousands of new bobs each day, Nash built a coating machine. Two girls coat 500 bobs per hour with it. The operator at the right takes the coated bob off with her left hand and applies an uncoated one with her right. The operator at the left coats the bob as it reaches her. It is revolving so an even coat of glue can be brushed onto its edge. In the foreground is a tray loaded with 180 grit in which bobs are "dunked" while turned. Two revolutions of the bob are made during coating, depth of dip being controlled by the exterior track. Bobs are held on each spindle by a threaded taper. At the first two stations after reaching the rail section, the spindle is reversed so the operator need only hold the coated bob and it falls into her hand. Then spindle direction is reversed again so the uncoated bob will be fed onto the driving spindle.

Practical Ideas

HAVE YOU A PRACTICAL IDEA? . . . If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. We pay for acceptable contributions prepared exclusively for this publication

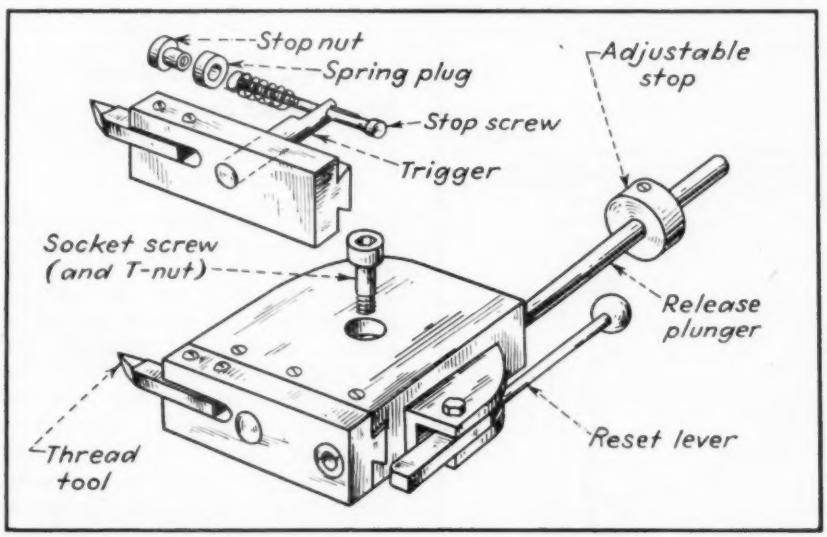
Semi-Automatic Retracting Tool Simplifies Thread Cutting

JOSEPH R. E. PAQUIN

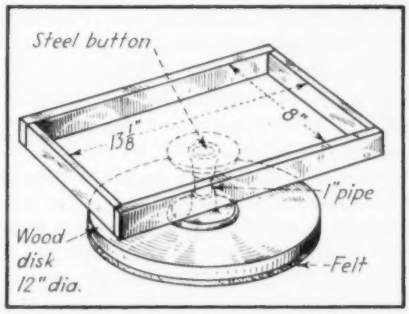
The tool illustrated provides instantaneous retraction of a lathe cutting tool at any predetermined point in the carriage travel. It was designed to render semi-automatic the production cutting of threads in the lathe with a single-point tool, when the thread must be cut to a shoulder. Previous practice was to "neck" the work close to the shoulder, then to cut the thread into this "neck." Considerable skill was required to retract the tool in time for it to clear the shoulder and a great amount of scrap and broken threading tools resulted.

This fixture makes unnecessary the "necking" of the work at all. This groove weakens the shaft appreciably and, in some classes of aircraft work, is a source of much trouble in heat-treating, as cracks usually develop at that point. With this setup, relatively unskilled help can be assigned to a job which was formerly done exclusively by experienced machinists, who are released for more important work.

The body is bolted to the compound with a socket capscrew and square nut. The toolholder is dovetailed to the body, and held in cutting position with the spring plunger which fits a hardened bushing at the rear of the toolholder. With a finger bolted to the ways or tailstock in correct position, the carriage and complete tool will advance until the stop prevents the plunger from moving. As soon as it leaves the bushing in the toolholder, the compression spring bearing on a trigger projecting from the toolholder snaps the tool out to the distance set by the stop nut. When the carriage is placed for the next cut, the reset lever quickly puts the toolholder back in cutting position. A built-in, adjustable stop provides a convenient means of pre-setting the amount of retraction of the tool.



When plunger is retracted by pre-set stop, toolholder snaps away from work; after repositioning carriage for next cut, reset lever moves tool back into place



Felt-based stand for use on large surface plate makes gage blocks handier to all inspectors

Revolving Tray for Gage Blocks Reaches Everyone

LOUIS DeL. BERG

It frequently happens when two or more men are working at a large surface plate they have occasion to take precision gage blocks from the same set. They will generally be working from opposite sides of the plate or from one end and a side so that the set of blocks will be facing only one inspector, making it awkward for the others.

To overcome this, a revolving tray to hold the gage-block set was built as shown in the illustration. The tray dimensions are for a No. 81 Hoke Set but these can be altered to suit any size box. A short 1-in. iron pipe nipple was threaded on one end only and screwed into a 1-in. flange mounted on a wood disk about 12 in. in diameter. On the bottom of the disk a thick felt was cemented in order to provide a surface that would not mar or scratch the surface plate. A second 1-in. flange was bored out to turn freely on the un-

threaded end of the nipple, and this was screwed to the tray. A steel button or washer was first set in the tray to provide a hard surface for the tray to turn on the nipple.

The lid of the box was removed and only replaced when the set was not in use. This inexpensive gadget has proved a great convenience and keeps one inspector from monopolizing the set as it is now accessible to all who use it.

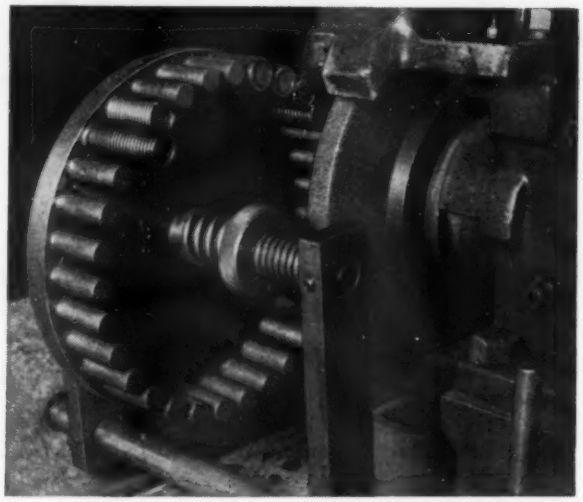
Pneumatic Machine Does Tube Burring Quickly and Accurately

CARL LUSK AND R. E. MOOREMAN
Goodyear Aircraft Corp.

A single motion of one lever clamps the tube, starts the cutter and controls the stroke of this machine which uses an air cylinder for the clamping action and an air motor to drive the cutting tool. A tube end can be perfectly finished in the time it takes to turn around.

The portable motor is secured to the ways with U-straps and set so its trigger will be pushed as it advances toward the tube. The feed is obtained with a stud which fits a slot in the lever. As the lever advances the motor, it also opens the valve admitting air to the cylinder thereby closing the vise and gripping the tube. As the pilot enters the tube the start button is depressed by the angle-iron stop bolted to the machine base.

The profile flycutter rounds the tube end neatly. When the lever is returned (a spring can be used) the motor is stopped and the vise automatically opened, releasing the finished tube. *Suggestion from the Board for Individual Awards, War Production Drive.*



Springs are rapidly ground and safely held by placing them on the studs of this disk and then rotating the disk to bring them against the side of the grinding wheel

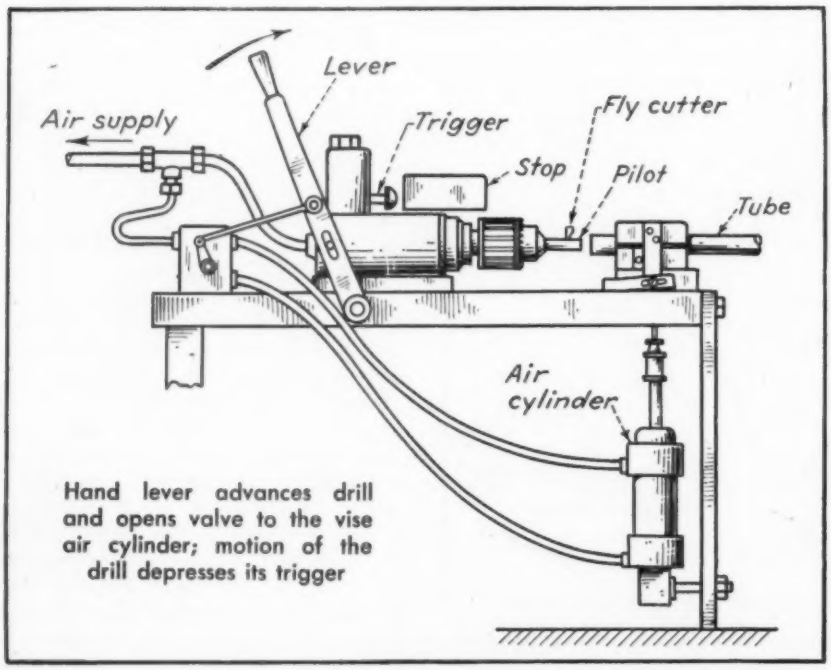
Disk Holds Short Springs for Grinding With Speed and Safety

GLEN W. HAZEN
Naval Torpedo Station, Newport

Short, comparatively heavy compression springs can be ground in an almost continuous operation by the use of the fixture shown in the illustration. Burning is prevented by flooding the springs with coolant, and the hazard involved in holding the springs by hand is eliminated.

The fixture consists of a rotating disk mounted on a horizontal shaft. Threaded collars on the shaft permit adjustment of the disk for different lengths of springs. One of these collars is spring-loaded to eliminate the possibility of play in the disk. There are 31 solid studs, of suitable size and length for holding the springs, mounted around the disk.

The springs to be ground are placed on the studs and the disk is rotated to pass them across the side of the grinding wheel. The spring tension supplies the grinding pressure. When the springs have been ground on one end they are reversed with a collar placed behind the spring so they can be ground to the proper length. *Suggestion submitted under the Navy Employees Suggestion Program.*

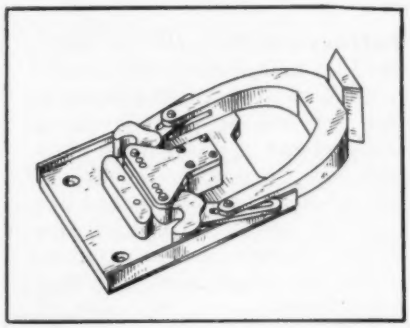


Hand lever advances drill and opens valve to the vise air cylinder; motion of the drill depresses its trigger

Pneumatic Powered Bender Makes Hooks and Collars

D. E. LAME
Tampa Shipbuilding Company, Inc.

Designed originally for forming cable collars, this machine displays foresight in its construction. Simple adjustments and a few interchangeable dies make it quickly capable of a wide range of rod, tube and strip bending. The setup illustrated can make any length of flat collar by changing the fulcrums, adjusting the horseshoe bolts and slipping different blocks on the two pins for the various lengths and thicknesses of stock. Different hooks and dies, some grooved for tubes, make it possible to bend any type of radius



Bending machine: open position shown; horseshoe is driven forward to close the two hook-jaws around the form-block

up to a full circle on a production scale. A few possibilities are double-hook straps, V-straps, rings, collars, and tube and rod bending of all types.

All that is needed to complete the tool is an air or hydraulic cylinder. *Suggestion from the Board for Individual Awards, War Production Drive.*

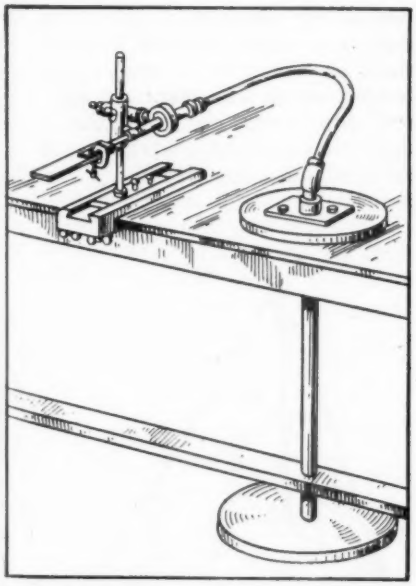
Universal Vise Holds Small Parts For Soldering and Welding

ANTON MATSON
Naval Air Station, Alameda

A sliding, adjustable-height stand is fastened to the bench. This supports a spindle, in bearings, to which the work-holding devices are attached. At floor level is a large disk fastened to a vertical shaft. The universal spindle is rotated by foot power on the disk, through the vertical shaft connected to the spindle with a flexible shaft.

The spindle can easily be fitted with various chucks, vises and clamps, enabling many kinds of small work to be held and turned in any position with both hands free to operate the tools or protected from heat or chemicals, whatever the operation may be.

If the foot turntable is thought awkward, it is suggested that a small motor be connected to the shaft, through suitable gears or belts, which would be controlled with a foot rheostat. A further refinement would be to add compound control by arranging a similar turning system for the spindle bearing itself. *Suggestion submitted under the Navy Employees' Suggestion Program.*

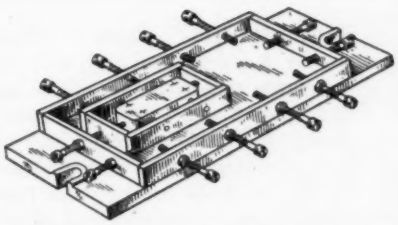


Flexible shaft enables work spindle to be adjusted to any position with foot-disk beneath the bench

Compact Lapping Tool Fits Confined Space

The barrel of this honer is only 4 in. long and 1⅞ in. in diameter, and the driving shank is 5/16 in. making it ideal for drillpress use.

Control is effected in the following manner: The Sunnen hone is expanded in its slot by a sliding wedge which is held by a disk. This disk has two guide pins projecting from it which do two things. The barrel has two longitudal slots to make the disk and hone rotate and the knurled sleeve has a circumferential groove in which the pins are free to revolve. This sleeve should be a free fit, and well lubricated so it can be held stationary without effort and moved back and forth, pushing the pins longitudinally and expanding the hone. *Developed at Consolidated Vultee Aircraft Corp.*



Inner box clamps work; outer box, fastened to machine, controls the four work positions

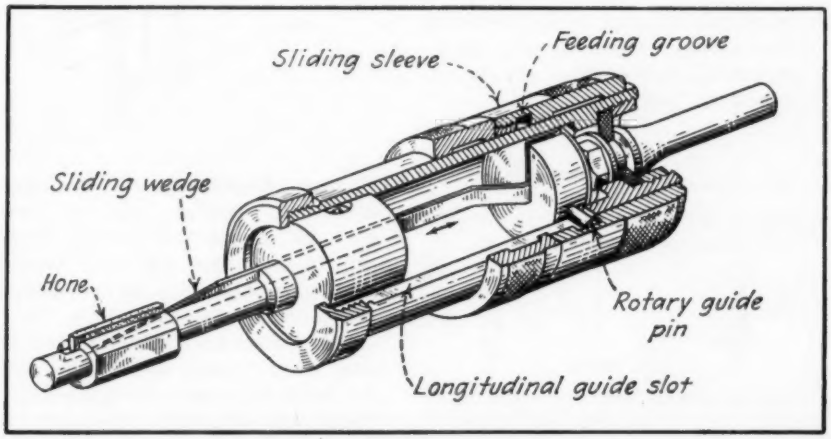
Sliding, Double-Box Fixture For Multi-Position Assembly

ROBERT MAWSON

Several types of blocks required that four screws be driven in varying rectangular patterns into the top face. Rather than make a special fixture for each block, I designed the one illustrated which will not only take anything in our present production, but is adjustable for an even greater range of work.

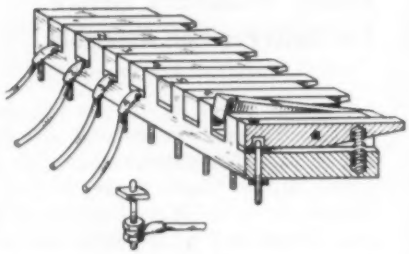
The outer box is fastened to the machine table. The inner box, holding the work, slides from corner to corner, positioning the four screws under the machine spindle in succession. Two types of adjustment are possible. The outer box has setscrews and locknuts all around to control the dimensions of the rectangle bounded by the four holes. The inner box has setscrews to adjust it to accommodate different workpieces.

The setscrew lengths for the outer box should be such that the range of spacing can be varied from say, ¼ in. to the full size of the box. In addition, it will be noted that since all screws do move independently, parallelograms, or quadrilateral shapes can be set equally well.

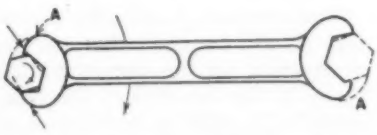


Small honer for drillpress use is controlled by knurled sleeve

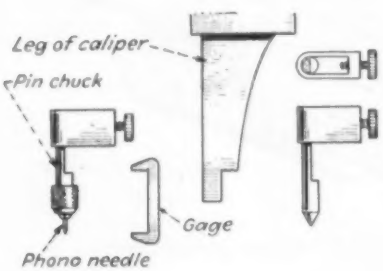
Terminal Test Block — These spring keys safely and securely grip any standard flat cable lug, and even plain wire in an emergency, for various power and instrument tests, and can be used for temporarily joining two loose ends. With all connections in one place, there is far less danger of accidental shorts or personal injury. *E. S. Wilburn, Navy Yard, Mare Island.*

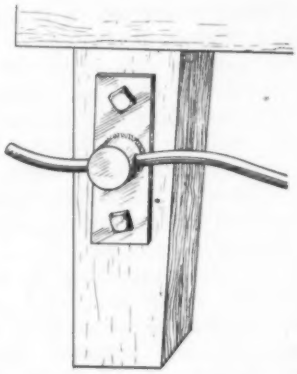


"Ratchet Wrench"—By grinding away part of the fork of an open end wrench and using it on a size smaller nut than intended, it will slip around easily in one direction, but grip securely in the other due to the couple obtained by the offset application of force. With its lack of complicating mechanism, this tool will get into places not possible with standard ratchet wrenches, and there is nothing to get out of order. *Foster B. Elliott.*

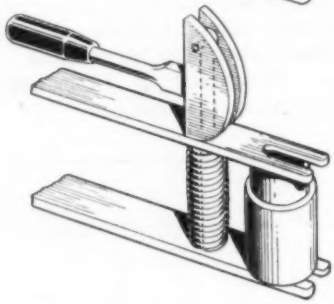


Precision Trammel Points—Without altering the vernier caliper, clamp-on points have been added to give it additional use as a trammel. Several types of points for various jobs suggest themselves and two of these are shown. *Elmer R. Clark.*



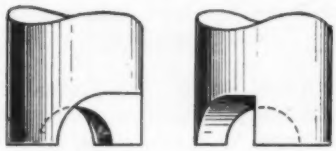


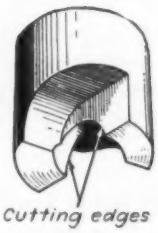
Rod Bender—A piece of 1½-in. bar stock is welded to a plate and a ⅝-in. hole is drilled through it. This is then lag-screwed to the leg of a workbench. With these cheap, convenient benders well distributed in every shop, results are more satisfactory all around. *M. R. Tannydinardo, Douglas Aircraft Company, Inc., Santa Monica.*



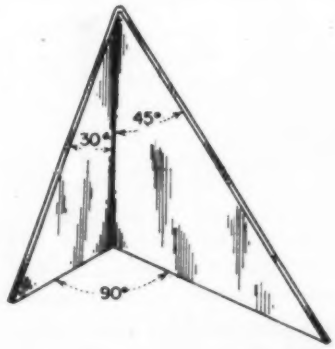
Spring Compressor — Welding electrode holder springs are quickly inserted with this tool, which uses the toe and wiper cam principle. The lever handle compresses the two forks between which the spring is placed, and stays locked because of the flat surface at the end of the cam. *Fred Page, Marinship Corp.*

Rotating Bolt-Cutter—This sketch shows a hollow-drill for literally drilling projecting bolts down to the nut leaving only a nicely rounded end. A piece of bar stock first has the button indent finished. Next, two diametrically opposite, tangential notches are milled which produce approximately the shape illustrated. *Bath Iron Works.*





Dihedral Triangle—A small piece of thin stainless steel was first carefully bent and checked to obtain a 90° dihedral angle with both surfaces flat and smooth, and the corner radius uniform. The sides were then cut and accurately ground, making one leg a 30-60, and the other, a 45-45 triangle. Resting on either face, or on the two short edges as shown, the upright surface will be truly perpendicular to the plane of support and several combinations of angles are ready for a variety of three-dimensional layout work. *Ben Frantzreb.*

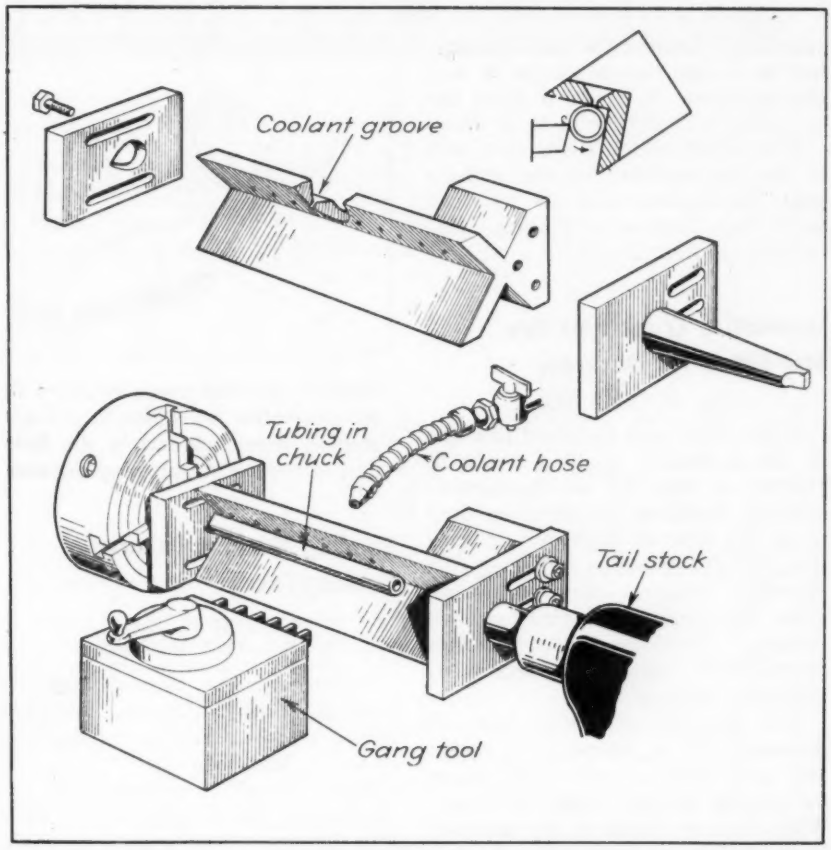


Tailstock Steadyrest For Steel Bushing Production

CHARLES T. KNOWLES AND
EVERETT E. SAYLES
Naval Air Station, San Diego

This idea consists of an adjustable V-block steadyrest and a gang tool with equally spaced cut-off bits. The V-block is bolted to a tailstock center through two slots enabling it to be offset the correct amount to accommodate any size of tubing. At the other end of the V is another adjustable cover plate to hold that end of the block against the tubing. There is a milled groove in the top of the block which distributes coolant to holes through the block, each hole being opposite one of the cutters.

In use, the rest is inserted in the tailstock and both guides loosened. Tubing is fed out from the headstock and the guides are adjusted until the rest supports the work with light pressure. *Suggestion submitted under the Navy Employees Suggestion Program.*



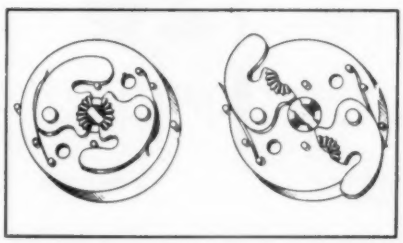
V-block rest holds long tube for multiple cut-off and has oil holes for even distribution of coolant

Combination Die and Beveler Finishes Rods in Single Operation

H. C. HARTLINE
Marinship Corporation

The job required that a large number of brass rods be threaded, and subsequently have the ends nicely rounded. Hand methods for the latter operation are never satisfactory and yet a machine setup for so simple a job is very time consuming.

Two hinged, serrated bevelers were mounted on the end of the die in such a way that the work automatically pushes them open against the pressure of two, weak leaf-springs, when the spindle is turning in right-hand rotation. As the threading progresses only the smooth surfaces of the beveler are bearing against the unthreaded rod, and when the die is removed no damage is done to the thread because the pressure is light. As soon as the rod leaves the die, the bevelers spring shut; rotation is reversed, and the tool again descends on the rod. The placing of the hinges is such that the friction of the cutting action tries to pull the leaves closer together, which is prevented positively by the two stop pins.

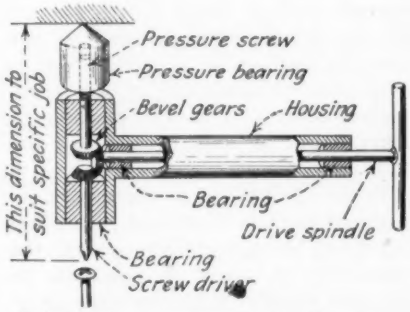


Diehead fitted with beveling leaves to chamfer rod after threading

Differential Gear Screwdriver Provides Own Thrust

This design offers a feature which can be developed in several ways. After positioning on the screw, all the operator has to do is turn the handle. As the screw advances into its thread, a nut, called "pressure-bearing" is turning off the opposing screw-spindle at the same rate. By selecting the correct pitch for the pressure-screw and nut, the screwdriver blade will follow ordinary machine screws, or can be adapted to to drive woodscrews, self-tapping or sheet-metal screws without exerting external thrust.

No actual construction details are shown, but one practical method employs a pipe tee and a suitable length of pipe for the handle-housing. Bronze pipe plugs are used for the bearings; they are first test-assembled to determine the length for the spacers required to keep the gears in mesh. The compressional thrust lead is kept from the gears and housing by having the two shafts meet in the center. One can be ball-ended and the other cupped to receive it, or both can be cupped and a steel ball placed between them. Under load, the thrust will be straight through; the gears will mesh properly and the stress on the housing will be negligible. The pres-



Schematic arrangement of pressure-screwdriver which drives wood, self-tapping or sheet-metal screws

sure nut is pointed for easy locating, but its design can be varied to suit the structure. In order to have the nut automatically held, it is fitted with a dowel which slides in a hole in the tee parallel to the spindle axis. The pressure screw and nut must have left-hand threads. *Developed at Bell, Niagara.*

Locomotive Crank Pins Are Step-Fitted For Accuracy

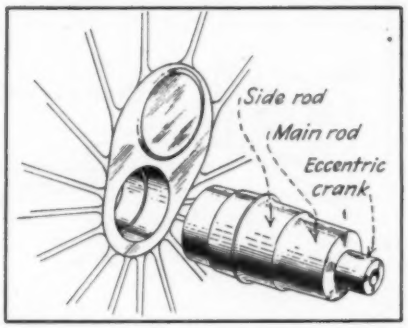
H. W. SHEPHERD

It has long been standard practice to use a double or even triple fit (called a step-fit) on locomotive cylinder bushings or liners so they could be entered halfway or further freely, greatly reducing the pressing distance required. Also, since the pressing begins on two surfaces simultaneously, accurate alignment is immediately and automatically secured.

This method of fitting has not generally been adopted for pins and axles, but is used to advantage by several of the largest railroads. When pins are fitted in this manner, there is less abrasion in mounting and demounting them and there is less chance for the parts to gall and stick, damaging both the pin and the hole in the wheel.

Many roads mount the eccentric crank on a new pin and then drill, ream, and fit bolt and key before the main pin is pressed in the wheel center. The now familiar ball center gage is used at the wheel press to set the crank to specified throw. After starting the fit, the gage is tried and the pin turned to the correct position by sledging or jacking on the eccentric crank, using it for a lever. A dummy center is fastened securely to the rim of the wheel press and assists the operation by keeping the pin straight and level. Once started with the pin in the correct position, there is little chance for the pin to wring around. If the step-fit method is used, the pin is only pressed about 3½ in. By using such a double fit, it is impossible to start a pin or axle crooked in the hole.

Some provision is necessary to prevent the lubricant used in mounting from becoming trapped near the shoulder. A small groove can be cut the length of the smaller fit to relieve this, or if the pin is hollow, a radial hole to the inside will do the trick just as well.



Several railroads use a two-step fit on locomotive main pins to prevent starting them crooked in the hole and to reduce the pressing distance

Sanding Machine Deburrs Bushing Faces

ERNEST H. GANZ
Navy Yard, Washington

This equipment, through high production with uniform accuracy, boasts large savings in the finishing of small bushings.

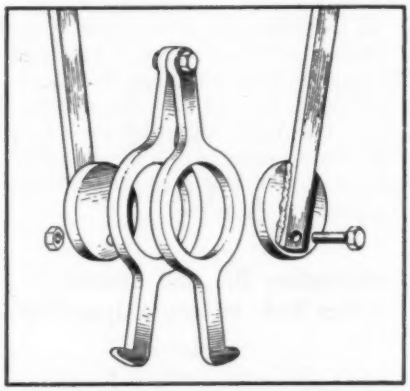
The assembly consists of two disks, one faced with emery cloth and driven at 2800 rpm by a ¼-hp motor through a V-belt, while the other, somewhat resembling a plate cam, remains stationary. The desired amount of pressure needed to keep the bushings in contact with the abrasive wheel is obtained with springs mounted at the rear of the stationary disk, and the adjusting nut limits its travel. In performing the deburring operation, the disks are placed face to face, and bushings feed into the magazine feed slot. Gravity causes the bushing to work its way downward through the recessed path although the wheel is spinning in the opposite direction.

Compound Double-Eccentric Cable-Eye Spreader

L. J. RACICOT
Marinship Corporation

The mechanical advantage principle illustrated by this tool should quickly suggest other applications besides the original one.

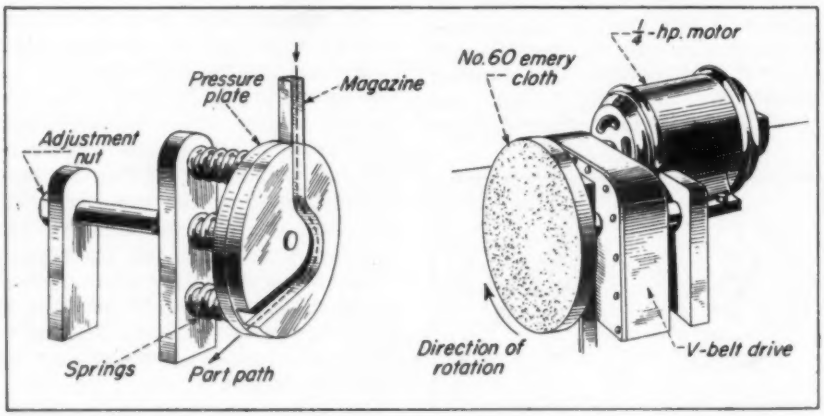
The two 4-ft. handles each have a circular disk welded at one end, and the arms are bolted together through a hole as near the periphery of the disks as possible. With arms together the disks are coincident, but when opened 180° the spread is equal to the diameter of the disk minus twice the distance of the hole from the periphery.



Exploded view showing disk-eccentric cams welded to long handle A-frame for opening cable eyes

These disks operate in circular apertures in an A-frame scissors, and in this type of tool no particular refinements are required to hold the components in place.

This principle can be applied simply to quick-acting clamps, vises, or die sets with good results.



Sanding machine with guard removed and pressure plate turned showing abrasive disk and channel for parts

Fluorescent Lamp Life—I

Charts permit determination of monthly replacements in relation to the average burning cycle

BY ROBERT R. WYLIE
Commercial Engineer
Sylvania Electric Products, Inc.

RECENTLY, manufacturers of fluorescent lamps announced an extension of the rated life of various lamps based on the number of hours the lamps were operated continuously. Table I shows new average life ratings with the approximate percent lumen output at 70% average rated life.

The average rated life indicated is the life of large groups of lamps burned under laboratory conditions. Individual lamps in plants have been known to burn much longer than the rated life, principally because the hours in the burning cycle are relatively long. In general use, the life of a large group of lamps burned under favorable conditions should approximate the figures shown in the table.

Data required. The announcement of these new life ratings led to the need for a simplified method of computing fluorescent lamp life expectancy. The series of charts presented in Figs. 1, 2, 3, 4, 5, and 6 enables one to determine the expected rate of monthly replacement of lamps when certain data relative to the installation are known. It should be kept in mind that these tables are based on lamps burned at correct voltage and under optimum operating conditions.

The accompanying information is needed in order to use the charts on the two pages.

1. Size of lamp
2. Number of lamps in installation
3. Number of hours lamps are operated continuously (hours burning per cycle)
4. Number of hours burning per day, week or year

Application of Charts. As an example, assume that a lighting installation consists of 500 40-watt lamps burning an average of five days per week for 15 hr. a day, turned on for 3-hr. periods. Referring to Table I, under the 40-watt lamp column, lamps burned on a 3-hr. cycle have a rated average

Table I—Rated Life of Various Fluorescent Lamps

Hours Burning per Cycle	Type T-8 15W, 30W		Type T-12 15W, 20W, 40W		Type T-17 100W	
	Life	70% Lumens*	Life	70% Lumens*	Life	70% Lumens*
3	2500	78	2500	84	3000	78
6	4000	72	4000	76	4500	72
12	6000	69	6000	70	6500	69

*Indicates percent initial (100 hour) lumens per watt of 70% life.

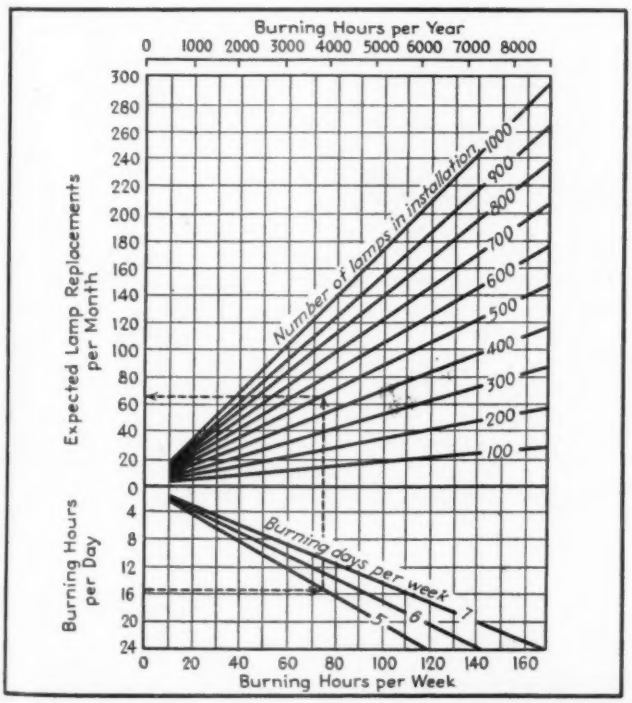


Fig. 1—Chart for computing expected lamp replacements per month, based on a rated average lamp life of 2500 hours

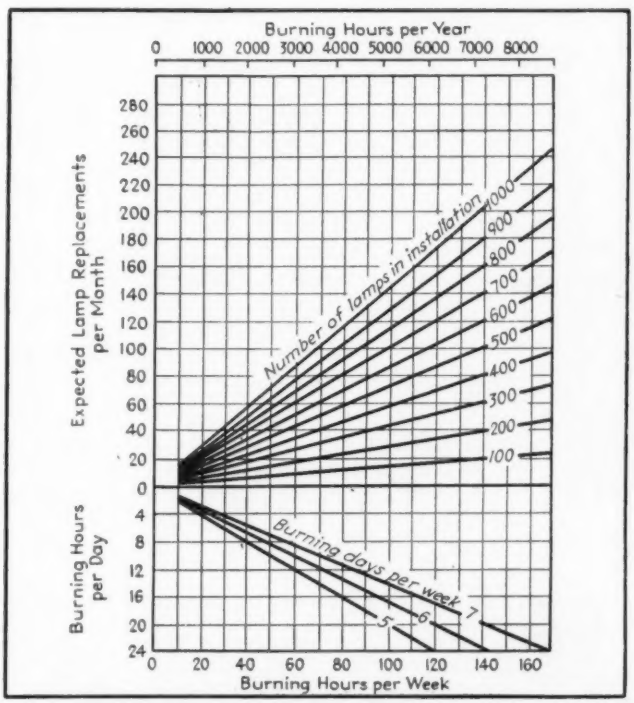
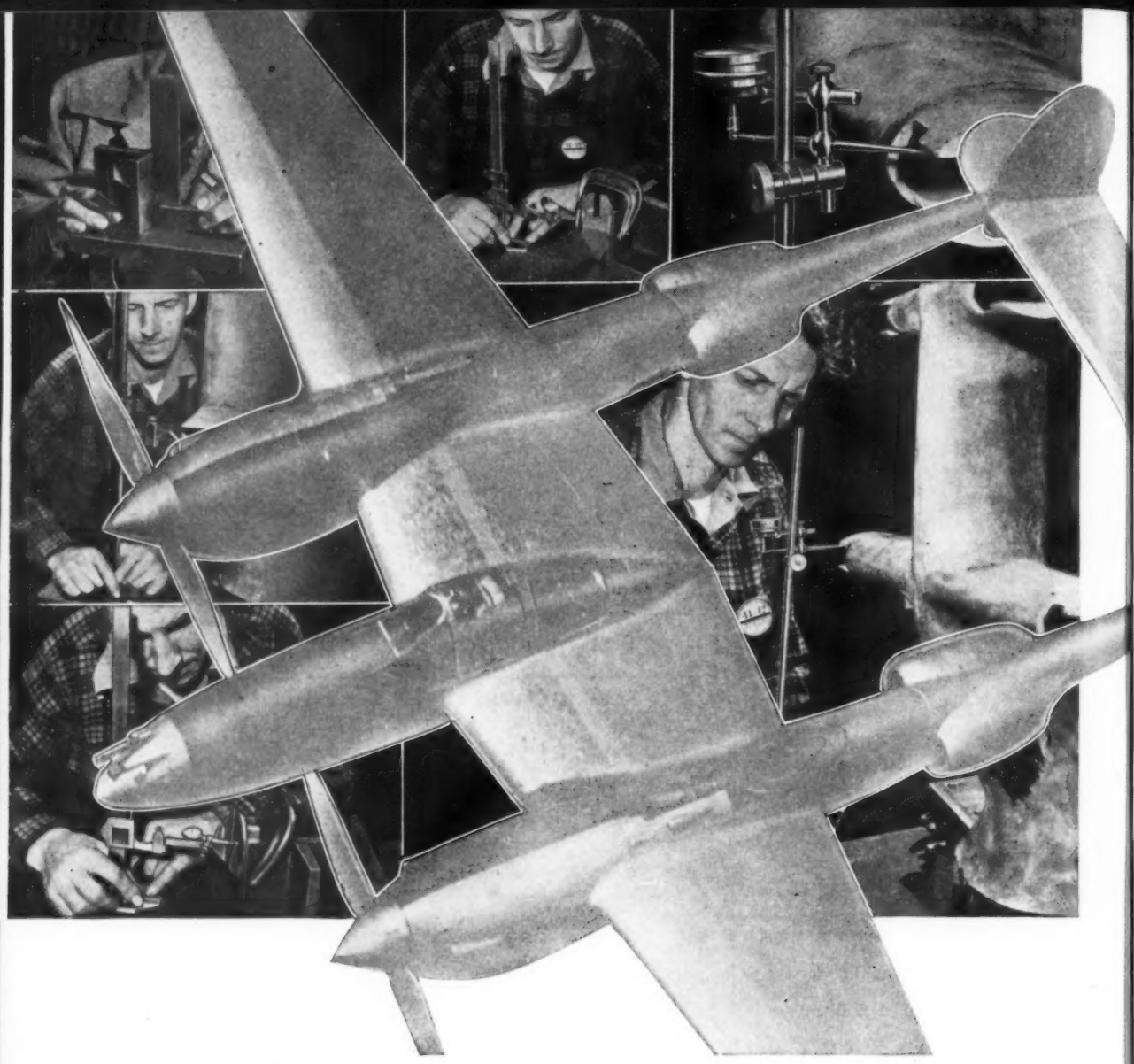


Fig. 2—Chart for computing expected lamp replacements per month, based on a rated average lamp life of 3000 hours

STARRETT TOOLS



Before TOKYO Saw Them . . . STARRETT TOOLS Looked LOCKHEED'S LIGHTNINGS Over

The "ON-TO-TOKYO" Model P-38L Lightning with its 425 mile an hour speed and 4000 pound bomb capacity called for countless precision measuring and inspection operations, many of which were performed with Starrett Micrometers, Vernier Gages, Dial Indicators and other Precision Measuring Tools.

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Fluorescent Lamp Life — II

life of 2500 hr., therefore Fig. 1 should be used. Beginning with the scale marked "Burning Hours per Day," follow along the line representing 15 hr. per day until the diagonal line representing five days per week is reached, and then up the chart until the diagonal line which applies to an installation of 500 lamps is reached, continuing to the left across the chart a value of 65 is obtained from the scale marked "Expected Lamp Replacements per Month."

If an installation should consist of 5,000 lamps rather than 500, the answer would be 65 x 10, or 650 lamps per month. Similarly, for an installation of 50 lamps the result would be 65 divided by 10, or 6½ lamps per month.

Non-Uniform Burning Hours

In plants where the burning hours per day are not uniform, the total burning hours per week should be computed and then the chart may be used by beginning with the scale marked "Burning Hours per Week," following up the chart from this line to the diagonal line representing the total number of lamps in the installation, and across to the expected replacements per month scale as before. Sometimes it is convenient to express the total burning hours on a yearly basis for, perhaps, the lamps may not be operated 52 weeks of the year. If the total burning hours per year is known the scale at the top of the chart may be used, and by following down to the intersection of the appropriate diagonal line for the number of lamps in the installation, and proceeding as before, again the expected lamp replacements per month may be determined.

It will be found possible to apply these charts to a wide variety of conditions, but care should be taken that the user always keeps before him the definition of rated average life.

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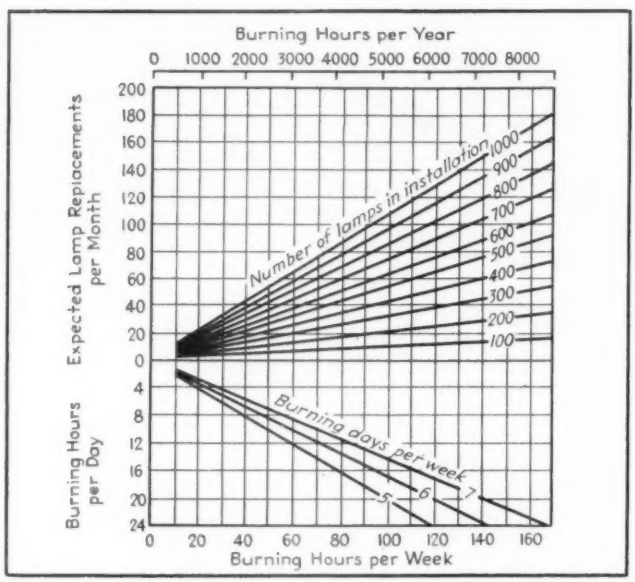

Burning Hours per Year
0 1000 2000 3000 4000 5000 6000 7000 8000
Expected Lamp Replacements per Month
Number of lamps in installation
1000 900 800 700 600 500 400 300 200 100
Burning Hours per Day
Burning days per week
7 6 5
0 20 40 60 80 100 120 140 160
Burning Hours per Week

Fig. 3—Chart for computing expected lamp replacements per month, based on a rated average lamp life of 4000 hours

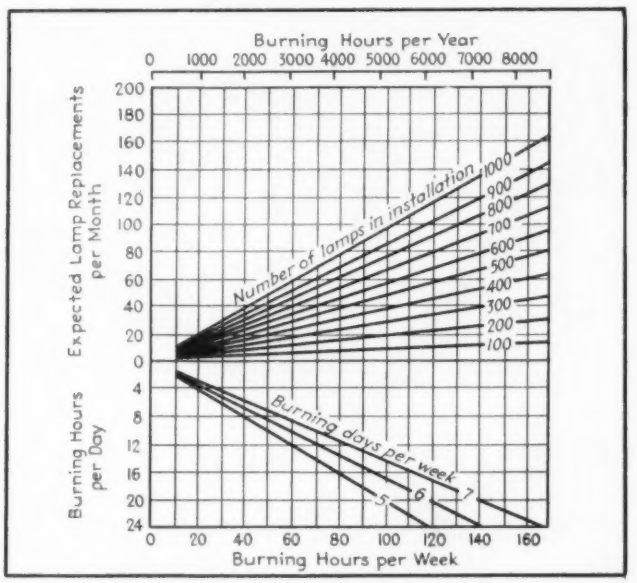

Burning Hours per Year
0 1000 2000 3000 4000 5000 6000 7000 8000
Expected Lamp Replacements per Month
Number of lamps in installation
1000 900 800 700 600 500 400 300 200 100
Burning Hours per Day
Burning days per week
7 6 5
0 20 40 60 80 100 120 140 160
Burning Hours per Week

Fig. 4—Chart for computing expected lamp replacements per month, based on a rated average lamp life of 4500 hours

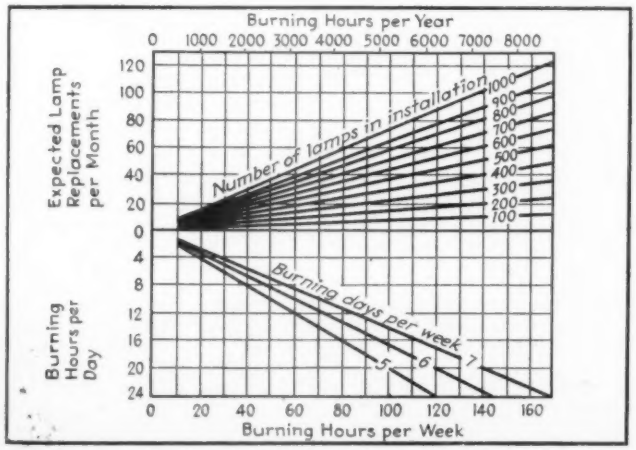

Burning Hours per Year
0 1000 2000 3000 4000 5000 6000 7000 8000
Expected Lamp Replacements per Month
Number of lamps in installation
1000 900 800 700 600 500 400 300 200 100
Burning Hours per Day
Burning days per week
7 6 5
0 20 40 60 80 100 120 140 160
Burning Hours per Week

Fig. 5—Chart for computing expected lamp replacements per month, based on a rated average lamp life of 6000 hours

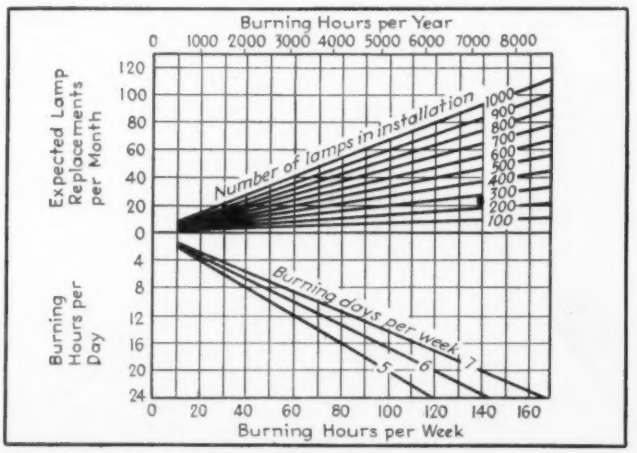
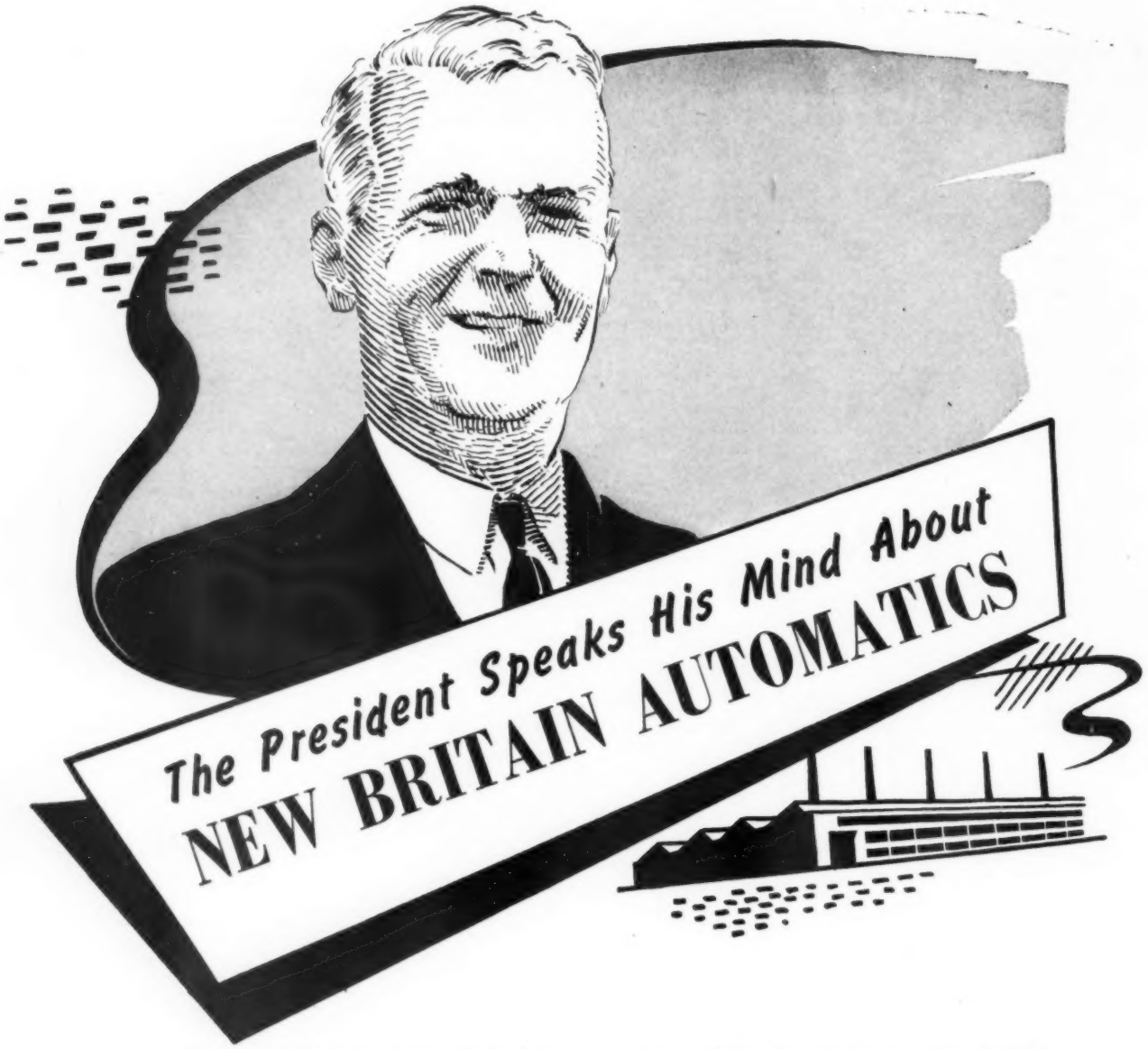

Burning Hours per Year
0 1000 2000 3000 4000 5000 6000 7000 8000
Expected Lamp Replacements per Month
Number of lamps in installation
1000 900 800 700 600 500 400 300 200 100
Burning Hours per Day
Burning days per week
7 6 5
0 20 40 60 80 100 120 140 160
Burning Hours per Week

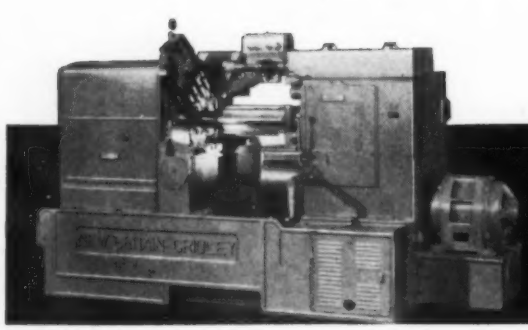
Fig. 6—Chart for computing expected lamp replacements per month, based on a rated average lamp life of 6500 hours



The President Speaks His Mind About
NEW BRITAIN AUTOMATICS

"I don't pretend to understand all about the exclusive New Britain features our plant manager keeps cheering for, but this I do know . . . we just can't seem to make production schedules too tough for the departments where New Britains are on the job. Even our oldest New Britain Multiple Spindle Screw and Chucking Machines have been giving us twenty-four hour performance for years, and they're still going strong. Naturally we are making plans to equip our plant with the most efficient machines money can buy, to hold our position in postwar competition, and you can be sure New Britains head the list!"

Whether you look at automatic machines through the eyes of the president, production chief, foreman or operator, New Britains rate "tops" for high, accurate production. Ask your **NEW BRITAIN** representative to show you how they can boost output and cut cost-per-piece, in your plant.



THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN, CONNECTICUT
NEW BRITAIN • GRIDLEY DIVISION

Gaging Business

Basic Outlook Favorable

Despite industry's current problems in getting back on the track to peacetime production, there is still no reason to revise earlier expectations of a generally higher level of industrial activity to meet current and potential demand. Orders are still piling up on steel plants; manufacturers are still taking delivery on all the steel they can get despite labor or OPA trouble; consumers are still seeking automobiles, radios; refrigerators and washing machines. Industry still seems to expect that current problems will be cleared up satisfactorily in the very near future.

This expectation was backed up a short time ago, by predictions of leading metalworking companies, made in a CPA survey, that by June, 1946 their volume of business will be 34% above the high monthly average of the first quarter of 1945. That would represent a substantial recovery from the current level of industrial activity.

Many Labor Difficulties

Although broad interest continues in the General Motors strike, other strikes have been hitting the auto industry. Strikes in the glass industry have hurt operations of Chrysler, Nash, and Packard plants. The strike at the Borg-Warner plant in Muncie, Indiana, has hit Willys-Overland and Studebaker, who get their transmissions from Borg-Warner. The General Motors strike has already hit Nash, which gets it front ventilators from GM, and other companies are expected to be hurt unless the strike ends soon.

Thus, the CIO's planned strategy of striking one auto company at a time has come to naught, due to the effect of GM strikes upon others and of strikes at suppliers' plants affecting various companies. The only major auto producer little affected right now is Ford, which makes its own windshield glass, and has been getting its body glass from a plant not strike-bound. Despite this, shipments from other suppliers have fallen off, curtailing operations moderately.

General Motors has instructed its suppliers to continue right on making parts under outstanding orders, but not to make shipments until the strike has been settled. The same applies to outstanding orders for machine tools and other equipment, the builders of which have been instructed to continue working on such orders. As might be expected, GM is not doing any new buying as long as the strike continues. Its steel suppliers are shipping to designated points, where the steel is being stored for future shipment to GM.

Press Bottleneck Worsens

The most critical item in the industrial equipment field continues to be presses, on which deliveries by major manufacturers extend from six months to 15 months. As a result, some builders have farmed out some press business to other firms, and some relief has been forthcoming on this score. But major plants continue to be hampered by shortages of skilled labor.

Inability to secure castings and forgings in increased quantities is another limiting factor on press production. Foundries and forge shops complain that they are unable to pay their workers overtime under present OPA ceilings, so that their production is thus hampered. Meantime, consumer goods industries are clamoring for presses to replace obsolete equipment and permit expanded production.

Tool Business Holds

Machine tool business continues to hold at good levels, showing some recovery from the declines right after peace was declared. Cancellations are still at low levels, in some cases averaging 6% of new business on hand. Labor trouble in some areas is restricting new orders.

Foreign business has been increasing, too. Although the French are the largest current buyers, Russia, Sweden, Switzerland, Finland and Greece are also factors in the export business volume. Sweden wants to rehabilitate its plants and to replace some equipment it has turned over to Finland to help the latter make reparations for Russia. The Swedish say that British tool deliveries are too long, and point out that their normal German sources are non-existant. Finland is also buying tools here to build up its industry into production for Russia to cover reparations.

Switzerland has also entered the American market recently, and Greece has sent a Purchasing Commission here to buy American equipment, including machine tools.

Russia has been buying tools for cash, and only purchasing special purpose machinery. A program is being prepared in Russia for the purchase of general purpose machinery to be launched early in 1946. The size of Russian purchases here will depend upon its ability to arrange adequate financing of such business in the United States.

French Buying $100,000,000

French tool purchases through 1946 are expected to total $100,000,000. The French already have bought $14,000,000 worth, and are in the process of placing another $20,000,000 in business to be paid in cash out of French funds in this country. Current purchases are under the First French Urgency Program, largely for such vital industries as railroad shops and bearings plants.

The other $66,000,000 in French business will be placed under the Second and Third French Urgency Programs, and will be paid out of funds provided under the newly agreed American loan to France.

Will Congress Halt Steel Strike?—While congress worked on a law intended to reduce strikes having nationwide repercussions, as urged by President Truman, the CIO steel workers prepared to go on strike around the year-end. Workers at the government-supervised strike vote, shown being taken, voted overwhelmingly in favor of a strike.

Truman's Anti-Strike Program is Criticized by Management, Labor

WASHINGTON — President Truman's intervention in the auto strike prevented a showdown between management and unions which, in case of a clear victory on either side, or a long stoppage, might have subjected his administration to severe attack.

His back-to-work appeal and his call for a fact-finding program, cleared him without commitment to either side, and made good his warning, before the labor management conference, that if it failed there would be a call for legislation. But he could only hope that work would be resumed quickly in the interest of reconversion and the public, which was in a squeeze between two minorities.

Fact-finding

The same forces which stopped the labor - management conference in Washington are opposed in Congress, which now has the impasse in its lap, in the form of bills implementing the President's fact-finding policy. The only difference is that public opinion, which did not bear strongly upon the conference, will control the decision on Capitol Hill.

Congress realizes that much of labor's drastic demands and its default of contract is local and outside of its leadership's policy. Therefore, Congress does not greatly fear labor reprisals at the polls, and has willingly received the President's proposition. Action will be prompt, probably by January 1.

All parties concerned still profess belief that collective bargaining is the best procedure. The extent to which freedom to bargain will be restricted by law will depend in the main on what labor and management do in the meantime. Both are bound to suffer, and with them the country.

The threatened steel strike probably could not be brought off till after the legislation is completed.

Divided Victory

Management in general will oppose labor's efforts to obtain a stronger voice in management, to get the right to examine management's records, to make prices and profits the basis of wage negotiation, and to authorize the subpoena of records. Labor is expected to make some gains along these lines, but in doing so it will have to accept greater responsibility for its own contracts and for its organizational revenues and expenses. Many Congressmen believe that labor made a mistake in using its current advantage to demand more wages, which can only contribute to inflation, when it might have made more important industrial relations gains.

In brief, Mr. Truman proposes appointment of fact-finding boards of three or more members (1) to receive labor disputes certified by the Labor Department and to make recommendations which would not be binding upon the parties concerned; (2) return recommendations with a 30-day no-strike no-lockout period; (3) subpoena persons and records of the disputing parties.

Canadian Surplus Tool Sales Running at $1,000,000 Monthly

OTTAWA—Sales of machine tools and equipment out of war-accumulated Canadian-government stores to private industry are running at the rate of about $1,000,000 a month. This disclosure was made as a parliamentary committee began digging into the operation of the government's disposal agency, War Assets Corporation. From officials of the corporation the committee got back complaints that they were being handicapped by priorities and lack of competent staff.

Stocks of tools are still far from being unloaded. The present rate of disposal of $1,000,000 worth per month will increase as rapidly as administrative machinery can be created.

Inventory Lacking

Staff is lacking to catalogue all tools properly and it may take between one and two years to get them all properly sold. A report on sales up to the end of October listed 1,738 invoices for machine tools and equipment for $6,341,283 and 274 sales of machinery for $2,343,938.

Certain priorities are imposed on the corporation by the government. For instance provincial and municipal governments are given first chance at surplus equipment of any kind. This requires a canvas or priority holders before offerings can be made generally and slows up disposal. It necessitates passing all reports and lists of surplus through a central point for screening and prevents decentralization.

Prices Set

In fixing prices on tools, War Assets Corporation was instructed to take account of the fact that production cost was in most cases higher than pre-war cost and also probable post-war cost. Except with special approval from the minister of Munitions and supply no sale was to be made for less than 68.2 per cent of the Canadian cost less depreciation at the rate of 0.9 per cent per month in which the tool was in operation. There was a further provision that no tool could be sold on this basis of depreciation at less than 25 per cent of the Canadian cost.

Most of Canada's tools were imported from the United States, and the Canadian cost for pricing purposes includes exchange, taxes and duties whether these were paid or not at the time of importation, but excludes costs of transportation and installation.

Basic Policies

General policy governing disposal of war surplus of all kinds including tools has been summarized as follows:

1. Today, when goods are scarce to sell all saleable surpluses at existing market prices but within ceilings;
2. Later, when surpluses become so great that they might constitute a danger to industry, to control the flow of such surpluses;
3. To make every effort to control the price;
4. To keep out of unfair competition with established business;
5. To seek expert advice from industry on price levels and marketing methods but not to act on such advice at the expense of public interest;
6. To sell abroad in harmony with other governments, everything that becomes available abroad and can be sold there;
8. To keep out the speculator;
9. To recover for the taxpayers of the nation and the original investors in those goods the largest cash return on their investments possible.

Pittsburgh Equitable Meter Is Now Rockwell Manufacturing

PITTSBURGH—The name of the Pittsburgh Equitable Meter Company has been changd to The Rockwell Manufacturing Co., to better reflect the recent expansion and diversification of the firm's manufacturing facilities. The new name is that of the President, Col. Willard F. Rockwell, who has headed the company since 1927. The same officers and directors continue to head the company and its various subsidiaries.

The Pittsburgh Equitable Meter Company name will be continued to designate the subsidiary marketing measuring equipment. The other subsidiaries include the Nordstrom Valve Co. (name changed from the Merco Nordstrom Valve Co.); The Edward Valve & Mfg. Co.; The Delta Manufacturing Co.; The V. & O. Press Co.; The Crescent Machine Co.; Rockwell International Corp.; Monessen Foundry & Machine Co.

Detroit Letter

CIO Loses "Friend"

It appears that the CIO has lost its "friend in court." And this fact may indicate a much faster end to the General Motors strike than was believed possible under previous conditions.

President Truman's sudden intervention and his plan to settle the automotive strikes, present and impending, has upset the labor leaders no end. They found that their "friend in court" has turned on them and that they cannot expect to be saved by the White House from the many mistakes that have been made in the past. There is some feeling that the President has not altogether forgotten Dick Frankensteen's biting speech made at the Democratic National Convention in 1944.

Murray Aids UAW

Philip Murray's intervention in the automobile strike, to the extent of getting both sides to Pittsburgh immediately after Truman's message to Congress, was also an indication that the CIO was going to have a hand in the UAW's fight for the 30 per cent wage increase. It was believed that the Pittsburgh meeting, which brought an immediate resumption of wage negotiations here, tied in the proposed steel strike with what was going on in the automotive industry. Chances are that both may get going in full stride before long and get reconversion over the hump.

The Pittsburgh meeting evidently cleared much of the air and brought concessions which will become apparent on both sides as negotiations go forward. The breaking down of the Chrysler contract negotiations, which ordinarily would call for an immediate strike, was another unforseen event which softened the previously adamant Walter P. Reuther and his GM staff of the UAW.

The parley resumed the day after the Pittsburgh conference with the chips off the shoulders. It was evident some agreement had been reached where the negotiators were willing to give a little to get a little. It was a hopeful atmosphere for the entire industry, even those not involved in the dispute.

Chrysler Negotiations

The Chrysler situation is an interesting one. The contract negotiations have been going on at the same time with the wage negotiations. The main things sought in the new contract by the UAW are a union shop and checkoff.

The contract, which expired during negotiations, was renewed for a short period. When no agreement was reached on December 4, the union asked for a renewal until January 15, 1946. The company refused but offered to renew the contract for one year as it stood. This the union refused and an all-night session failed to bring a compromise. No strike was called and work continued without a contract.

Production Lagging

Meanwhile, strikes, shortages and general uncertainty are holding passenger car production back to a minimum. A quick check of the companies showed:

CHRYSLER: Some truck production but little or no passenger car production. Principal trouble now is lack of bodies from Briggs, which has been hit by the glass strike.

FORD: Good for three to four weeks. The company made a little over 20,000 cars. So far glass has been no problem because it has been obtaining body glass from a Minneapolis company. It makes its own windshield glass here. The company may be forced to reorganize its glass plant to produce more body glass and less windshields, forcing it to reduce output of cars.

HUDSON: Going one day and down the next. It has been very ragged, although claiming a good supply of parts on hand.

GM Strike Hits Nash

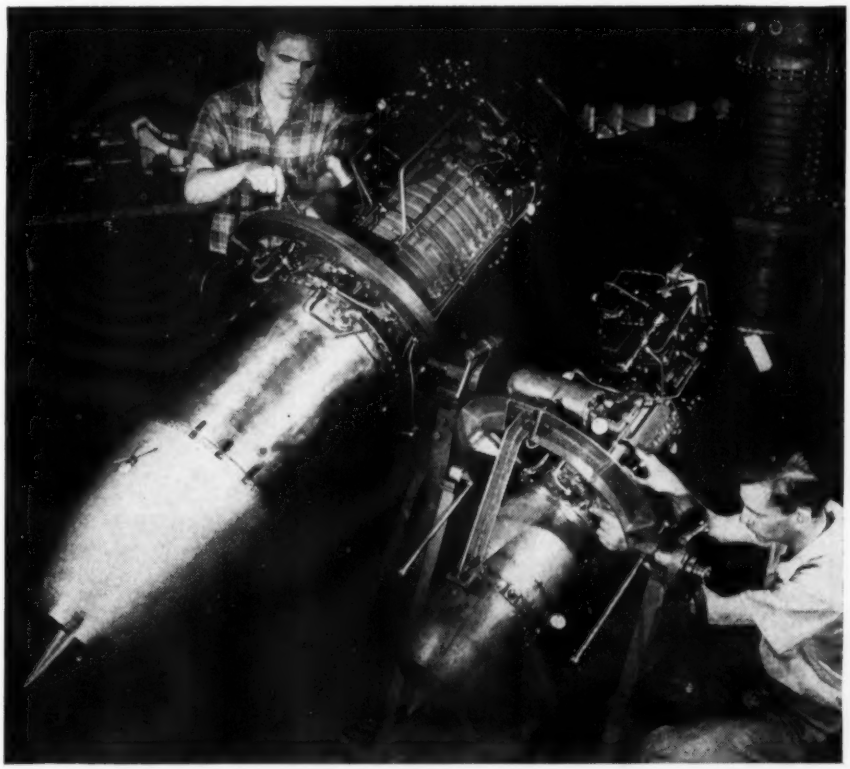
NASH: In production but looking ahead only two or three weeks. It has been hit by the glass strike and the GM strike, as it gets its front ventilators from GM.

PACKARD: Has built a little over 1,000 cars but has been hit because of Briggs' trouble with glass. It does not make its own bodies yet.

WILLYS: Out of production on jeeps for eight weeks. Its shortage is transmissions, which it gets from Borg-Warner, Muncie, Ind., which has been strikebound.

STUDEBAKER: No production for the same reason. It also gets transmissions from Borg-Warner.

KAISER-FRAZER: Still promising cars in January. But who knows how they are going to do it?



Large and Small Jet Engines—These two versions of jet aircraft engines were designed and built by Westinghouse for the Navy Bureau of Aeronautics. The jet on the left was designed to power Navy combat planes, while the one on the right was designed for a "buzzless" buzz bomb. Westinghouse is building a $10,000,000 plant and research laboratory for peacetime production of gas turbine aircraft engines.

Metalworking Expects 122% Recovery By Next June, C.P.A. Survey Shows

WASHINGTON—Metalworking industries expect to show a 122% gain over the September, 1945, level of business by next June, according to a survey of leading companies in the major subdivisions taken by the Civilian Production Administration. CPA's report on the progress of reconversion covered from 20% to 89% of the various metalworking groups, with better returns being secured from some industries than others.

Although the CPA report indicates that these groups had experienced a 42% drop in business volume in September, 1945, from their average monthly shipments during the first quarter of this year, the accompanying table indicates that metalworking companies will recover this decline in December, 1945. By June, 1946, the reports reflect the opinions of major companies that they will be operating at a level 34% above the first quarter 1945 average experience.

CPA figures indicate that companies doing $550,363,000 worth of business in September, 1945, expect to expand to a $980,590,000 volume by December, and then go to a $1,-

RECONVERSION STATUS AND FORECASTS OF LEADING PLANTS IN METALWORKING INDUSTRIES—SEPTEMBER 1945-JUNE 1946

(monthly rates in thousands of dollars)

Industry	Monthly Average 1939	Monthly Average 1st Quarter 1945	Actual Sept. 1945	Manufacturers' Forecast Dec. 1945	Manufacturers' Forecast June 1946
Cutlery & Edge Tools	1,773	5,113	5,176	4,418	5,455
Hand Tools, Files & Saws	3,671	11,357	7,411	9,465	9,098
Hardware	4,312	7,217	4,935	6,447	8,180
Stoves, Ranges, etc.	6,683	7,640	7,589	11,552	18,360
Vitreous Enameled Products	1,072	1,649	1,486	2,355	2,635
Metal Doors, Windows, Sash & Trim	1,291	2,081	1,519	1,875	2,775
Clocks & Watches	4,413	3,712	3,241	5,135	8,155
Silver Ware	3,421	2,452	2,873	4,830	5,845
Aluminum Ware	1,497	1,365	1,117	2,464	3,725
Electrical Measuring Instruments	1,892	2,979	1,807	3,743	4,025
Electrical Generating & Distributing Apparatus	20,281	71,882	55,465	56,947	58,958
Electrical Appliances	3,078	3,163	1,416	6,800	10,008
Radios	11,248	63,400	17,366	28,536	44,345
Communication Equipment	11,950	88,739	33,771	38,895	36,757
Steam Engines & Turbines	848	2,346	1,174	1,983	1,437
Internal Combustion Engines	6,095	35,034	19,052	24,996	27,137
Tractors	18,805	66,633	39,747	46,561	54,709
Agricultural Machinery	7,868	17,070	17,655	19,249	27,591
Construction Machinery	5,050	19,431	13,798	15,970	17,572
Oil Field Machinery	3,133	7,479	7,037	8,207	8,794
Mining Machinery	1,218	2,735	3,325	3,695	3,845
Machine Tools	7,583	20,203	15,832	16,709	16,694
Machine Tools & Other Metalworking Machinery Accessories	2,560	14,928	7,898	7,842	9,570
Metalworking Machinery & Equipment n.e.c.	3,097	9,137	5,066	6,694	7,653
Food Products Machinery	1,879	4,136	4,048	5,199	6,382
Textile Machinery	3,707	4,267	4,917	6,213	8,626
Woodworking Machinery	398	1,951	1,614	1,792	1,897
Paper & Pulp Mill Machinery	719	890	1,026	1,457	2,016
Printing Machinery	1,383	1,248	1,101	1,680	3,379
Pumping Equip. & Air Compressors	2,196	9,354	5,361	6,779	6,098
Cars & Trucks, Industrial	564	3,885	3,965	3,806	3,730
Measuring Instruments, Mech.	1,585	3,965	2,401	2,970	3,325
Stokers, Mechanical	620	1,100	1,159	1,672	1,635
Industrial Machinery n.e.c.	3,518	15,721	8,242	12,099	10,309
Office & Store Machines	9,295	9,671	10,882	16,000	21,548
Scales & Balances	445	878	1,140	1,355	1,550
Laundry Equipment, Domestic	2,222	1,190	825	3,662	5,850
Commercial Laundry & Dry Cleaning Machinery	979	1,912	3,252	3,024	3,572
Sewing Machines	1,858	2,463	2,113	2,637	3,885
Refrigerators	16,107	12,905	11,686	31,981	55,826
Cars, Trucks & Trailers	181,128	236,667	95,262	364,318	570,682
Automotive Parts & Accessories	23,323	70,850	28,234	55,562	75,221
Locomotives	2,054	25,798	13,543	26,767	19,626
Cars & Equipment, Railroad & Street	5,608	17,961	9,403	24,841	32,051
Containers	14,417	19,112	21,019	19,855	25,333
Metal Furniture	4,698	6,652	4,725	8,157	11,974
Plumbing & Heating Equipment	9,417	19,385	14,076	15,782	19,528
General Industrial Machinery Parts & Equipment	10,486	46,666	24,613	27,614	32,725
TOTAL	**431,445**	**986,372**	**550,363**	**980,590**	**1,320,091**

SOURCE: Civilian Production Administration. n.e.c.—Not elsewhere classified.

320,000,000 level by June, 1946. This achievement would compare with the $986,372,000 monthly rate experienced in the first quarter of 1945, and the $431,445,000 monthly average for 1939.

Auto Makers Lead

The major recovery will be experienced by manufacturers of cars, trucks and trailers, who expect to more than double their monthly rate of the first quarter of 1945. Makers of household equipment, representing smaller groups of metalworking industries than the automotive field, also expect substantial expansions. Among machinery manufacturers, makers of agricultural, oil field, mining, food products, paper and printing, and commercial laundry machinery, all expect good gains in shipments by mid-1946. Although machine tool and metalworking equipment builders do not foresee greater business than during the first quarter of 1945, it is interesting to note that a slightly larger volume than the September, 1945 rate is expected by next year. This is more than double the 1939 average rate of business.

New Construction and Expansion

Buick Motor Div., General Motors Corp. is expanding its plant facilities in Flint, Mich., by the addition of 1,325,000 sq. ft. of floor space. Construction of the new buildings is now going on.

General Motors Corp. has leased the entire North American Aviation Plant at Kansas City, Kans., for the assembly of Buick, Oldsmobile and Pontiac cars. Installation of automotive assembly equipment is expected to start before the end of the year.

E. C. Atkins & Co., Indianapolis, Ind., is planning to build a completely new and modern plant, costing at least $1,500,000, and covering approximately 500,000 sq. ft. Work on the new program has already been started and is scheduled for completion by late fall of 1946.

Libby-Owens-Ford Glass Co., Toledo, Ohio, plans a $5,000,000 construction program for its Plaskon division, involving large plastic resin manufacturing units and other buildings adjacent to the division's research laboratory.

Reynolds Metal Co. has acquired the manufacturing properties of the **Aluminum Products Co.**, including fabricating and stamping plants in LaGrange and Lemont, Ill., and a tandem rolling mill in LaGrange. The company plans to spend several hundred thousands of dollars to equip the plants.

Midco Tool & Supply Co., Oklahoma City, Okla., is working on expansion plans to increase the plant to twice its present size.

The **Oliver Machine Tool Co.**, of Chicago and Downers Grove, Ill., recently purchased the **Hoefer Manufacturing Co.**, Freeport, Ill. While continuing the manufacture of machine tools, plans are being made to completely modernize the plant and equipment.

Tube Turns, Inc., Louisville, Ky., has approved the leasing from the Reconstruction Finance Corp. of $3,000,000 worth of Defense Plant Corp. equipment, which had been installed for war work. In addition, the board of directors authorized the purchase of $500,000 worth of equipment to round out the company's production facilities.

Electric Auto-Lite Co., Toledo, Ohio, is adding two new plants to the 23 they already operate. One 250,000 sq. ft. plant will be for the production of metal goods at Sharonville, Ohio, while the other, occupying 150,000 square feet in Vincennes, Ind., will make batteries.

Hydro Power, Inc., wholly owned subsidiary of the **Hydraulic Press Manufacturing Co.**, Mt. Gilead, Ohio, is erecting a new plant in Springfield, Ohio. The plant, which will produce hydraulic pumps and controls, will be in production by Feb. 15, 1946.

The **Chevrolet Motor Div., General Motors Corp.** has purchased land in the Van Nuys section of Los Angeles for the construction of a new assembly plant to supplement production at Chevrolet's Oakland, Calif., plant.

Deepfreeze Div., Motor Products Corp. is spending over $1,500,000 for the addition of 100,000 sq. ft. to the company's factory in No. Chicago and for new equipment.

General Motors Truck & Coach Div., Pontiac, Mich., has started its modernization and expansion program whereby it will add 1,500,000 sq. ft. of floor space to its present facilities. The program includes three major building projects: an assembly plant for production of GM cruiser-type coaches, a plant for the manufacture and assembly of GM engines, and a new engineering building for experimental work.

Minneapolis-Honeywell Regulator Co., Minneapolis, Minn., has undertaken a $3,500,000 expansion program involving additions to plant and machinery in Minneapolis, Chicago, Philadelphia and Toronto.

Cleveland Steel Products Co., Cleveland, plans to erect an additional plant on West 117 St., Cleveland, at an estimated cost of $1,000,000. An adjoining office building will also be constructed.

The **Buffalo Arms Corp.**, Cheektowaga, N. Y., has been sold by the Reconstruction Finance Corp. to the **American Machine & Foundry Corp.**, New York for $1,500,000. In addition, American Machine will purchase equipment and machinery equalling the cost of the plant.

Fedders Manufacturing Co., formerly of Buffalo, will lease three buildings of **Frank J. Quigan, Inc.**, Maspeth, N. Y., on Jan. 1, and will purchase another building in Maspeth.

Evans Products Co. has acquired a new plant, nearly three times as large as its present Detroit plant, in Plymouth, Mich. Transfer of all plant operations to the Plymouth site is expected to be concluded in less than four months.

The **Newark (N. J.) Manufacturing & Repair Dept., Westinghouse Electric Corp.** plans to acquire land in Hillside, N. J., for the erection of a building, costing over $1,000,000, to allow for the department's expansion of warehouse, service and manufacturing facilities.

Myler Plastics Corp., New York, has broken ground for the erection of its new factory at Plainville, Conn.

Detroit Gear Div., Borg-Warner Corp. is starting an expansion program to add more than $12,000,000 worth of machinery and facilities.

Carrier Corp. plans to construct a new $2,000,000 plant at Camillus, N. Y.

Timken-Detroit Axle Co. is planning a $5,000,000 expansion and improvement program which will include two additions to the Detroit plant and one for its Oshkosh, Wis. plant. Also, new machinery, tools and equipment will be purchased.

OPA Steel Price Delay Laid to Labor Trouble; Small Mill Relief Studied

WASHINGTON—Little steel companies appear generally agreed not to accept any price increases that may be offered by OPA after meetings with the industry Dec. 10 and 12. The obvious reason is that, as demand slacks off, all purchasers would rush to large producers, for lower prices, leaving the small operators without orders—and worse, with the ill will of old customers.

However, 12 little steel producers have broken with the policy of the committee and have indicated a willingness to accept price increases if awarded by OPA. A few others may do so. But not enough to affect the decision of the committee. Those who raise prices can get them while the supply is short.

The Dec. 10 meeting at Pittsburgh, with the industry in general, considered relief of hardship cases. Then OPA's General Steel Products Industry Committee met at New York Dec. 12 "to further explore price relief for (small) non-integrated companies."

1946 Relief Promised

Price Administrator Chester Bowles, who recently refused an increase to large companies (the request was by the entire industry) promised that the problem "would be reviewed promptly and carefully when the next financial returns of the steel companies are submitted after Jan. 1."

That is what shows on the surface. Behind OPA's rejection of steel price increases was the inescapable pressure of existing strikes in auto and other industries, and the threatened strike in steel, for higher wages.

Labor Reaction Feared

On the merits of the steel price case, OPA was ready to grant increases ranging from $2.50 to $4 per ton, against demands for $7. But such increases, based on past production costs, would have confirmed steel producers' claims that they are not making a profit, and would have weakened the unions' demands for increased wages. Although the Administration thus seems to have demonstrated its sympathy with steel workers, there is some thought that OPA's rejection of price boosts would discourage their demand for a $2-per-day wage increase.

There will be strong opposition in OPA, and in the Administration, to any price increases for big producers, because any hoist in steel, key-stone of American industry, will be regarded as a general break in the line against inflation. The post new-year study of financial returns can, like any other intricate survey, be brought to any desired conclusion.

The industry insists that an immediate price increase is necessary, and that if wages are raised, still another. The industry does not think that OPA based its decision against price increases on 1945 data which was submitted, but on labor and political considerations. Furthermore, the industry contends that the 1936-1939 base period used by OPA was a sub-standard peace period, and that the first 9 months of 1945, a war period, were abnormal with only a limited number of prices yielding fair profits.

Subsidies Unlikely

It has been suggested that, since war powers are still in effect, the small steel producers, if they show genuine hardship, might be subsidized with public funds for a limited period. This would not put them at a competitive disadvantage against big producers. But war subsidies were paid only to boost production, and probably cannot be applied to this case.

Auto Makers Still Take Steel; Mills Booked Beyond March

PITTSBURGH—Very little holdup tonnage has been reported thus far and it is indicated that attempts will be made to keep steel rolling to the motor industry as long as there was a place to store it and men to handle it at the point of destination. It was questionable, however, how long this could continue, for material handling in the destination centers was at a critical point.

The reason for the desire to obtain as much steel in storage as possible is that auto manufacturers, once the GM strike is settled, will want to resume car output as rapidly as possible. Steel inventories were none too high at the start of the strike and the probabilities are that the automobile troubles will be settled before any in the steel industry—provided, of course, a steel mill walkout is ordered put into effect. Then, too, there are a number of auto companies which have no strikes. Some parts makers have had to call for holdups in shipments.

Shipment Pressure Holds

The pressure for steel shipments overall is really tremendous. There is such a widespread demand that any concern which has to ask for a holdup in shipments is supplanted instantly by someone else clamoring for the same tonnage.

Sales departments have to limit the tonnages they will take in relation to expected capacity in the various divisions. Everyone is filled up for the first quarter of 1946 and mills could easily be obligated well beyond that. In some items such as sheets the runover will fill up mills for the full first half of next year. It is for this reason that the normal logic of pricing in the steel industry will not hold should the OPA grant increases to some of the smaller manufacturers, particularly the non-integrated producers. During a period such as that which lies ahead consumers would pay more for steel than the price lists of the large companies—provided they can get the tonnage. This would not be true as soon as conditions tended to return to normal and competitive conditions would re-assert themselves. However, one of the difficulties of the non-integrated producers has been that, because of factors affecting ingot output and prices, it has been difficult to receive what they would like to have in the form of semi-finished shipments to them.

Unprofitable Items Made

For some time it has been the complaint that integrated companies have been losing money on some of the so-called "bread and butter" items, and there was a tendency toward production of the more profitable lines. In only a few cases, however, did a mill stop making a certain product altogether because it was unprofitable. Where a plant had a number of such items, the semi-finished allocated to them was reduced and this likely will continue to be true. On the other hand, the mill will want to use up all the steel it makes, and generally productive capacity and manpower are such that the so-called profitable rolling operations will not be able to absorb all the steel made.

Eastern Freight Rates

U. S. Steel has made the first move in an attempt to crack the eastern freight rate structure. It is of vital importance to Pittsburgh and may affect the rumored plans of the corporation to erect a steel plant in the east. U. S. Steel, it is reported, has asked the railroads to cut the steel freight rate from Pittsburgh and Youngstown to the Eastern ports where the material is destined for coastwise movement to the Pacific coast. The Pittsburgh-to-Baltimore rate (lower than that to either New York or Philadelphia) is now 30 cents. On Pacific-consigned material, a 23 cent rate is asked which, incidentally, would compare with a 20-cent export rate. A railroad hearing originally scheduled for December 12 has been put off to January.

Washington Bulletin

Symington Irked

Surplus Property Administrator Symington is increasingly irked by disposal agencies' practice of ignoring, and finding ways around, his policies. A major blowup in surplus disposal is prevented, or postponed, only by numerous other disturbances which require much of the attention of congress and administrative officials. Labor-management disputes, slow conversion to civilian production, the atomic powder keg, unification of the armed forces, wasteful prolongation of military operations, post-war wars and bickering among the Allies—are a few of the problems that make the conservation and distribution of surplus goods seem unimportant by comparison. A congressional survey of SPA appears to be a matter of time only.

Symington has gained some prestige for his ability and his energy but, as many observers predicted, the enormous amount of goods involved, and the complexity of distribution, and political pressure for special treatment, may be too much for any man or any board to cope with. Mr. Symington is a prosperous man, who came to Washington only because the President asked him to, and reports already circulate to the effect that he will quit unless he gets some powerful backing.

Patent Changes Likely

Talk of revising the U. S. patent system goes on continually, and only cub reporters get excited about it. But something might happen, because Casper W. Ooms, the new Commissioner of Patents, is a man of forward vision and determination. Mr. Ooms says he is the spokesman, patent-wise, for the little fellow with an idea, who should be able to get a little booklet at any postoffice which will take all the mystery out of patent procedure. The Commissioner wants to attract young technicians to his staff, who will take an interest in the "frontiers of science." He intends to call upon the press for full reports on patent progress, in addition to the stories it usually prints on freaks and abuses. And he will call upon congress for numerous reforms. Friends of Mr. Ooms believe he will improve the office, or break himself on its hide-bound traditions.

Atomic Power Distant

People are getting tired of atomic talk and are settling down to technical problems at hand. As well they may, for top A-scientists are telling congress that no practical power or other developments can be expected for a long time. Disposition of the international aspects will be wrangled out in Washington, with little advice from sidewalk citizens.

Nazi Helicopter

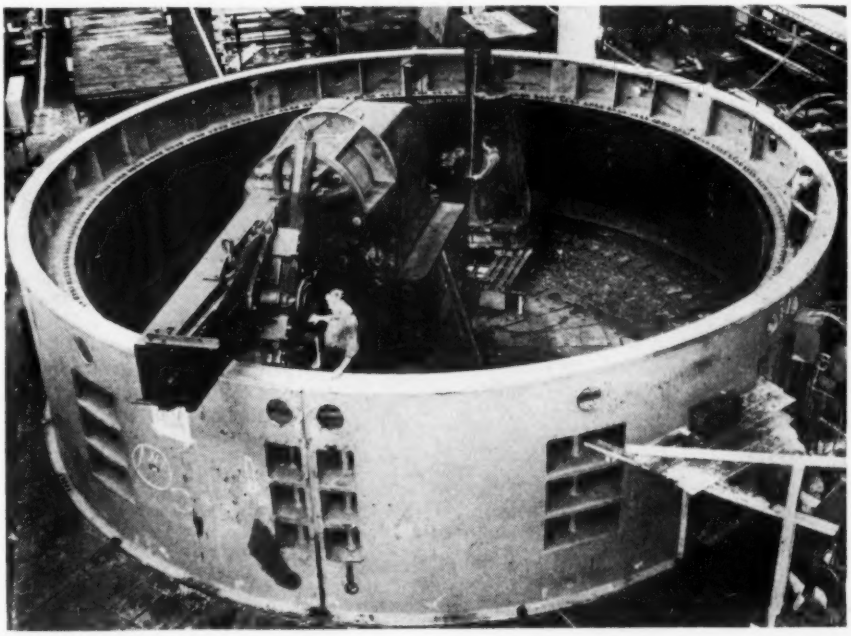
The Germans had in experimental status a 16-ton helicopter capable of lifting 10,000 pounds. It had two 2,000 h.p. engines (twice as much as a standard DC-3 airline plane) and was intended for use in setting tanks and trucks across rivers and for hoisting steel girders and the like into place. The design is being studied in this country. Such helicopters might be used on industrial and construction jobs where cranes are not practical.

Surplus Plants Available

Dozens of surplus war plants are being offered for sale or lease by the Reconstruction Finance Corporation. Among them are several aircraft facilities, a crank case plant, an aircraft servicing plant, aluminum extrusion plants, steel plants, an acetylene plant, dry cell plants, oil refineries; plants to make radio accessories, radio and radar, aircraft engines, castings, aircraft propellers, aircraft parts (adaptable for general industrial production), jewel bearings, magnesium sand castings, iron ore concentrate, electric alloy steel ingots, machine parts and light metal products, precision tools, castings and forgings, automobile assemblies, and many others. General information can be obtained from any RFC regional office; detailed information and engineering reports are available at Detroit, Los Angeles, Richmond, Philadelphia, New York, Chicago, Jacksonville, Boston, and Houston offices of RFC, depending which is nearest.

Tail Propellers

It is fairly safe to figure that the shift from air-cooled to liquid-cooled engines for commercial airplanes will continue until reciprocating engines are partially displaced by jet and turbine plants. Liquid engines are "buried" in thick wings of big planes, or inside the fuselage, with aerodynamic efficiency considerably increased by cleaner airfoils. Liquid cooling was much improved during the war. Shaft and gear linkage for locating propellers at the tail, removing noise and vibration from passenger compartment, are now regarded as successful. First outstanding example is the tail-drive Douglas DC-8, which will soon be in operation on some airlines.



More Equipment for Russia—Besides equipment seizures in Germany and Manchuria to help restore its industries, Russia is still buying large amounts of machinery and other industrial equipment in the United States. The armature frame, shown at General Electric's plant in Schenectady, is for 1,125-ton hydro-electric generator, the first of three being built for Russia's Dneiprostroi Dam to replace destroyed units. The armature core and frame are the largest ever made. The first complete unit, weighing over 1,125 tons, is scheduled for April delivery.

General Eaker Tells Engineers of Next War at ASME Annual Meeting

NEW YORK—The 66th annual meeting of the American Society of Mechanical Engineers was held November 26-29 with headquarters at the Hotel Pennsylvania. More than 5,000 members and guests registered for its sessions. Ranking officers of the Army and Navy and experts in the fields of engineering and science appeared on the four-day program.

A high spot of the meeting was an address by Lt. General Ira C. Eaker, deputy commander, U. S. Air Forces, who spoke on the last war and the next. General Eaker said that Germany failed because she did not cement the partnership between engineering, production and military operations. He described typical feats of bravery by our airmen in both the European and Pacific theaters of operation. He warned that, because of engineering advances, time and space factors will be almost eliminated in future warfare. For this reason it is essential, according to General Eaker, that we revamp our diplomatic relations, establish a unified intelligence service, and have an armed force ready.

General Eaker was introduced by A.S.M.E. president, Alex D. Bailey. Mr. Bailey awarded the Society's honors for 1945 and presented the next president of the society, D. Robert Yarnall.

Pendray on Rockets

At a "rocket" dinner Monday evening, the affiliation between the American Rocket Society and the A.S.M.E. was jointly announced by the two societies. The gathering was addressed by G. Edward Pendray, a founder of the Rocket Society, who described the nature of jet propulsion and the various kinds of engines that have been developed to utilize it. He was followed on the program by Lovell Lawrence, Jr., president, Reaction Motors, Inc., who spoke on the technical aspects of liquid propellant rocket motors.

Rear Admiral Harold G. Bowen, chief of the Office of Research and Invention, Navy Department, told the society that scientific study and training are essential to develop such fields as the harnessing of atomic energy, radar and electronics, supersonic speed and the rocket and jet propulsion of missiles and aircraft. Admiral Bowen addressed a session devoted to the theme, "Research for National Security." Other speakers on this subject were Major General G. M. Barnes, director of research and development, Ordnance Department; Major General B. W. Chidlaw, deputy commander, T3 Engineering, Wright Field; Brig. General Georges Doriot, Director Military Planning Division, Office of Quartermaster General, and Dr. William F. Durand, former chairman, Division of Engineering and Industrial Research, National Research Council.

Leadership Training

A year's military training for the country's use was advocated by General Jacob L. Devers, commanding general of the Army Ground Forces, speaking on the subject, "Training for Leadership." General Devers deplored "trigger-happiness" which he defined as a state of mind in which the individual is convinced that we are in a new era in which one merely pulls a trigger to accomplish anything. This sort of thinking, said the general, blocks out the actual realities of life.

Dr. D. Robert Yarnall, President-Elect, ASME, confers with Lt. Gen. Ira C. Eaker, Deputy Commander, Army Air Forces. Gen. Eaker spoke on "Victory Through Air Power" at the Society's Annual Dinner

Rear Admiral James L. Holloway, Jr., Assistant Chief, Navy Personnel for Demobilization, spoke on the same theme. He defined the attributes of leadership as ability to react with promptness and decision, living and acting the part of a real leader, willingness to accept responsibility and hard work, ability to plan, and above all, character and integrity. Other speakers on this topic were Brig. Gen. H. R. Kutz, Chief, Military Training Service, Office of Chief of Ordnance, and David C. Prince, vice president, General Electric Co.

The industrial plant should adopt the Army's "unified command," according to H. L. R. Emmet, works manager of the General Electric Co., Erie, Pa., before a management session. Mr. Emmet held that decentralization of responsibility to division heads can play a large part in bridging the gap between the maximum efficiency of physical plant and the absolute efficiency of the entire plant including personnel.

Durand Receives ASME Medal—Alex D. Bailey (left), president ASME, for 1944-45, presents the ASME Medal to Dr. William F. Durand of Stamford University. Dr. Durand received the award in recognition of his work in jet propulsion, and his leadership of the engineering and industrial research division of the National Research Council

New A.S.M.E. Officers

President: D. Robert Yarnall, Yarnall-Waring Co.

Regional Vice Presidents: Alexander R. Stevenson, Jr., General Electric Co.; Samuel R. Beitter, Consulting Engineer; J. Calvin Brown, Consulting Engineer; Rudolph F. Gagg, Wright Aeronautical Corp.; Edward E. Williams, Duke Power Co.; Linn Helander, Kansas State College.

Directors-at-Large: Edgar J. Kates, Consulting Engineer; J. Noble Landis, Consolidated Edison Co. of N. Y.

Reginald E. Gillmor, former President of Sperry Corp., addressed the management luncheon on "Opportunities in Peace Time."

At the safety session, John Grimaldi, research engineer, National Conservation Bureau, stated that the placing in industry of physically impaired workers would constitute no employment problem if management follows a definite program of fitting the man to the job. Mr. Grimaldi cited tests made by government agencies and by industry showing that when a worker is placed so that the disability does not affect efficiency in a particular job, disabled workers frequently were more efficient than normal workers.

Labor Status Debated

Labor relations were debated by Lee H. Hill, McGraw-Hill Publishing Co., and Edward T. Cheyfitz, national chairman, the Casting Division of the Mine, Mill and Smelter Workers, C.I.O. Their topic was the "Optimum Areas of Collective Bargaining." Mr. Hill held that the terms and conditions of employment referred to in the Wagner Act and elsewhere should be defined so that both parties know the extent of their legal obligations. He said that collective bargaining would receive much more wholehearted acceptance if unions would refrain from invading managerial functions directly or indirectly. Mr. Cheyfitz, on the other hand, opposed such definition by law and in general was against "curbs." He called for the acceptance of the union and collective bargaining, acceptance of management's right to manage, and acceptance of creative participation of the worker.

Among the many papers on metal working, "The Handling of Single Point Tools at Watervliet Arsenal" was described by Lt. Col. E. G. Moffat. Colonel Moffat said that the number of carbide tools in circulation at the arsenal had been cut from 5,000 to 3,500 by simplified sizes, handling of tools from the crib to a centralized grinding section in lots of 50 to 100, and production line tool grinding.

A.S.M.E. HONORS AND AWARDS

A.S.M.E. Medal:
Dr. William F. Durand,
Professor Emeritus, Stamford University
Holley Medal:
Sanford A. Moss,
General Electric Co.
Worcester Reed Warner Medal:
Joseph M. Juran,
New York University
Melville Medal:
William J. King,
Battelle Memorial Institute
Junior Award:
Bruce E. Del Mar,
Douglas Aircraft Co.
Charles T. Main Award:
Jack Darnell,
Allis-Chalmers Mfg. Co.
Undergraduate Student Award:
Ensign John W. Erickson
Honorary Membership:
Rear Admiral H. G. Bowen,
Office of Research and Invention, U.S.N.
Dugald C. Jackson,
Professor Emeritus, M.I.T.
Audrey A. Potter,
Dean of Engineering, Purdue
Sir William Stanier,
London, England
Dr. Wong Wen-hao,
Minister of Economic Affairs, China

G. Edward Pendray explained jet propulsion at the "Rocket Dinner."

Continuous Milling

Proper design for continuous milling was described in detail by Arthur A. Schwartz, chief tool research engineer, Bell Aircraft Corp. R. Y. Moss, production engineering manager, the Sheffield Corp., told of recent developments in the field of crushed dressing of grinding wheels. The cutting action of reamers was the subject of a paper by T. F. Githens, mechanical engineer, Cleveland Twist Drill Co.

Prof. O. W. Boston and Associate Professor W. W. Gilbert, Department of Metal Processing, University of Michigan, reported on the face milling of cast iron, the influence of feed, depth and speed. A paper presented by G. P. Witteman, assistant metallurgical engineer, Bethlehem Steel Co., was devoted to specific studies pertaining to tool wear, chip characteristics, and surface finish of free-cutting steels.

Welded Parts

George L. Snyder, chief engineer, Lukenweld, Inc., spoke on design considerations for welded machinery parts. Robert H. Clark, Warner & Swasey Co., told of the function of the electrical engineer as the collaborator on machine design.

During the annual meeting there were some 50 committee meetings on the business and technical activities of the society, including the standardization work which is making great strides. Visitors to the meeting were given the opportunity of making plant trips.

Dealers May Handle Surplus Tools At 12½% Commission

WASHINGTON—As had been expected, the Surplus Property Administration has made provision for the appointment of dealer agents by the RFC, to receive 12½% commission on sales of surplus tools and other equipment under the Clayton formula. No commission would be paid to agents for: (a) sale for their own use; (b) sale to a person in possession; and (c) sale to Federal, State or local governments.

Machine tool manufacturers, distributors, and used machinery dealers may qualify as surplus equipment dealers if they qualify under RFC standards. Applications must be made to RFC for appointment as dealer-agents. Commissions will be computed on the basis of total sales for each month, not to exceed 12½%. Allowances will be made for dealers' expenses involved in storing and handling tools transferred from plants or RFC warehouses.

Although RFC has planned this step for some time, it is reported that there was some uncertainty over putting the plan under way for fear that it would be criticized for granting commissions while there was a seller's market on surplus tools. However, lack of experienced personnel and the tacit admission that recognized dealers were actually aiding many purchasers at no profit to themselves, were factors that justified this step, it is reported. The rate of commission had been a bone of contention, since some dealers held that the low prices of surplus items warranted a higher-than-usual commission.

NAM Anniversary Meeting Discusses Prices, Labor, Production, Atom

NEW YORK—The most explosive session of the Golden Anniversary Congress of American Industry, held by the National Association of Manufacturers, December 5-7, was an exchange on the importance of price control between Senator Robert A. Taft (Ohio) and Price Administrator Chester Bowles. Senator Taft charged that pricing policies were holding back full peacetime production and employment, while Mr. Bowles defended ceiling prices as essential for preventing inflation and protecting the public.

Pointing out that he had originally voted for OPA as a war measure, Senator Taft urged that congress limit the fields for such controls. He stated, "If we can get production, prices will come down by themselves to the lowest point justified by increased costs. If we hold prices at a point where no one can make a profit, there will be no expansion of existing industry, and no new industry in that field. We must adopt a policy that recognizes that some increase is necessary to bring about ultimate production." He charged OPA with being unjust to many firms.

Taft Attacks OPA

Senator Taft said that price control was impossible to administer when it was combined with the policy of removing wage restrictions and encouraging wage increases.

In contrast to this stand, Mr. Bowles stated that price controls had saved the country $36,000,000,000 in the cost of living over the past eighteen months, and asked the NAM to abandon its stand for repeal of all price controls by February 15. He said that NAM's stand was "a most dangerous threat to the future wealth and success of our free enterprise system."

Labor-Management Report

On the opening day of the Congress, Ira Mosher, President, NAM, gave a report on the labor-management conference. He said that although management went to the conference prepared to work out the difficulties in various ways, labor apparently wanted to maintain the status quo. Although management suggested many plans and compromises at the conference, labor turned them down without offering alternative suggestions.

In order to bring about full production, and thus lower prices and raise the American standard of living further, Mr. Mosher said that there are several necessary steps: (1) our national indebtedness and our tax system should be stabilized; (2) favoritism for certain groups should be ended, for the good of the entire nation. He added that it was high time that legislation was passed to require responsibility on the part of labor.

With respect to the President's fact-finding proposal, Mr. Mosher feared that it might be used to "pry into confidential records."

Balanced Budget Asked

During the second day's session, H. E. Humphreys, Jr., chairman of the NAM taxation committee, recommended that congress balance the budget and bring Federal expenditures down to $20,000,000,000. He called for lower taxes, saying that it was economically unsound to tax 30% of the national income. He said that our postwar tax policies should be designed to encourage peak production and maximum employment. He said that businessmen polled by NAM expect corporate taxes to be reduced from 36% to 34% in 1948, to 29% in 1951, and 27% in 1955.

Veteran Training Urged

General Omar Bradley, Administrator of Veterans' Affairs, urged industry to expand facilities for training returning servicemen. He pointed out that about 9,000,000 men may be discharged by early summer and many of them will have no previous business experience. He stressed the need for special attention to disabled men, saying that statistics showed that such men have made good.

Atomic Energy Aspects

A symposium on atomic energy, presided by Dr. James B. Conant, president, Harvard University, agreed that atomic energy may be utilized for peacetime purposes in anywhere from three to 25 years, and that atomic power plants, technically feasible now, may be able to compete with $15-a-ton coal. Maj. Gen. Leslie Groves, director of the atomic bomb project, was the most pessimistic on this score. The group agreed that it would not be practicable to use atomic power in autos or planes for some time, but that atomic power might be used by ocean-going ships.

Dulles On Foreign Aid

On the closing day, John Foster Dulles, Advisor to Secretary of State at Council of Foreign Ministers in London, stated that we should give priority for assistance to Britain, France, Holland and Belgium, because their welfare will contribute the most to the environment which the United States seeks. Commenting on Russian secrecy, Mr. Dulles stated that the Russians feared that their people might be disillusioned on their own form of government if they learned how the democratic nations live, while they also feared that if the outside world knew how communism worked in Russia, Red supporters would also be disillusioned. He said that the propogation of Communism "seems to depend upon concealing the way in which it works."

50% OF BRITISH TOOL OUTPUT FOR EXPORT

LONDON—The British Machine Tool Trades Association believes that annual output of machine tools should be maintained at around $100,000,000, to improve British efficiency, and increasing exports to 50% of total machine tool production. Furthermore, this level of activity would maintain the industry in a position to expand rapidly should national defense demand it. (Peak British tool production was the $186,000,000 turned out in 1943.) In order to make British industry independent of foreign sources, highly specialized tools, previously made here only at a financial loss, may be built postwar. Shortage of dollar exchange has resulted in a virtual ban on imports of U. S. tools, but this may be lifted in cases where such equipment will increase the production of goods for export.

The Association is participating in the preparatory work of compiling schedules of tools its members would like to obtain from Germany under the reparations scheme. Technical representatives of the various industries concerned will be sent to Germany to make selections of the desired equipment.

One Week Industrial Finishing Courses Offered by DeVilbiss

TOLEDO—In the first half of 1946 four one-week courses for industrial finishers will be offered by the DeVilbiss Company's School of Spray Painting. Free to users of DeVilbiss spray painting equipment, the courses will start on January 14, March 11, April 8 and June 10. Reservations should be made at least two weeks in advance.

N. Y. Victory Lighting Jubilee Shows Reconversion Progress

NEW YORK—Advances in the art and science of illumination passed in review at the Victory Lighting Jubilee sponsored by the General Electric Company and 135 lighting equipment manufacturers at the 17th Regiment Armory, New York City. Opening Nov. 26 for five days, the show keynoted improved industrial, commercial and home lighting for the peacetime era ahead.

The GE section of the exhibit featured a collection of 2,000 different kinds and sizes of lamp bulbs and fluorescent tubes. Special emphasis was placed on fluorescent lighting in the industrial field.

Germicidal lamps were on display and 40 of them were arranged around the vast auditorium to protect exhibitors and visitors from respiratory infections. The lamps, which emit ultraviolet energy to kill airborne bacteria and viruses, will undoubtedly find a broader field of industrial application to safeguard the health of plant employees.

Tanned Factory Workers

GE officials predicted that industrial workers will be able to get healthy suntans while they work through factory installation of a new fluorescent sun lamp that can be inserted into any ordinary fluorescent fixture. Another innovation in the fluorescent field was represented in the form of tubes bent into circle for home, commercial and industrial lighting. Known as "circline" tubes, they permit use of smaller fixtures and get away from the necessity of long fluorescent tubes.

Many of the displays revealed lighting refinements in industrial equipment emerging from the war. Improved inspection lighting devices, versatile local lighting fixtures for metalworking and other industrial machines, and large fixtures for general plant lighting were exhibited. Interesting educational exhibits were presented by the RLM Standards Institute for industrial lighting equipment and the Electrical Testing Laboratories.

SPI to Hold Plastics Show In New York April 22-27

NEW YORK—The first National Plastics Exposition will be held in New York on April 22-27 at Grand Central Palace, it was announced by the Society of the Plastics Industry, Inc. New materials, methods and products will be shown. While primarily a trade affair, arrangements will be made to invite the public on certain days. The annual meeting of the society will be held in New York during the exposition.

Names in the News

John R. Hertzler

John R. Hertzler was recently elected vice president of the York Corp. He was with York from 1927 until 1942 when he entered the Navy where he served as a liaison officer of the Army-Navy Munitions Board. Mr. Hertzler has held various jobs with the company, starting in the shops and field organization. He was later assistant general sales manager and general sales manager of the firm.

H. C. McCaslin has been elected vice president in charge of engineering and a director of the Kaiser-Frazer Corp., Detroit. Formerly with Willys-Overland Motors, Mr. McCaslin has been in the automobile manufacturing field for 25 years.

Harry E. Conrad has been appointed executive secretary of the American Society of Tool Engineers. Mr. Conrad was with General Motors for eleven years and during the war served as manager of the War Products Division of the Automotive Council for War Production.

P. R. Bassett, formerly vice president and general manager of Sperry Gyroscope Co., has been elected president to succeed **R. E. Gillmor,** resigned. **C. M. Green,** formerly vice president for manufacturing, has been appointed vice president and general manager.

Warren J. Kilburn, sales manager of the American Gear & Mfg. Co. since 1931, has been appointed general manager.

W. H. Henry has been appointed assistant manager of the Industrial Div., in charge of motors, of the General Electric Co. **P. A. McTerney** will be in charge of large motors and gear motors, and **A. W. Bartling,** fractional hp. motors.

Hickman Price, Jr., has been elected vice president, director and treasurer of the Kaiser-Frazer Corp., Detroit. He was formerly an official of the Foreign Economic Administration.

C. P. Milne, manager of the tank plant, has also been made general works manager of the Massey-Harris plants in Racine, Wis. and Batavia, N. Y. At the same time, **C. E. Krause,** secretary of the firm, was appointed manager of supply and control.

Emil F. Gibian has been appointed chief industrial engineer for the Cleveland operating divisions of Thompson Products, Inc., and Thompson Aircraft Products Co.

Otto M. Jensen, who has been with the Peerless Machine Co., Racine, Wis. for many years, has been appointed works manager and vice president in charge of engineering.

John J. Cronin, general industrial relations director of General Motors Fisher Body Div. since 1941, has been appointed general manufacturing manager to succeed the late **George C. Paterson.**

George R. Prout, general manager of General Electric Company's air-conditioning department, and **L. R. Boulware,** in charge of operations of General Electric affiliates and consultant on marketing and merchandising, have been elected vice presidents of the company.

J. L. Singleton has been appointed manager of the 60 district offices of the Allis-Chalmers Manufacturing Company's general machinery division's sales department.

Sidney Oldberg has been appointed executive engineer for the Wilcox-Rich Div., Eaton Mfg. Co., Cleveland. For ten years before joining Eaton, Mr. Oldberg was with the Chrysler Corp., recently in charge of aircraft engine research and development.

Frank W. Jones has been named to head the Light Metals Products Div., Northrop Aircraft, Inc., Hawthorne, Calif.

Eugene W. Norris, formerly director of technical service of the Aircraft Industries Association, has been appointed chief engineer of the Luscombe Airplane Corp., Dallas and Trenton, N. J.

J. K. Keogh has been appointed manager of the Allis-Chalmers Manufacturing Company's district office in Pittsburgh.

John E. Nipar has been named manager of sales and distribution for powdered metals and powder metallurgy parts for Keystone Alloys Co., Derry, Pa.

BUSINESS ITEMS

Herbert Gleitz

Curtiss - Wright Corp. has acquired the **Marquette Metal Products Co.**, Cleveland, Ohio, manufacturers of precision parts and assemblies for the automotive and aviation industries since 1920. **Herbert Gleitz,** president and general manager of Marquette, will retain his position, while **G. W. Vaughn,** president of Curtiss-Wright, will assume the newly created post of chairman of the board.

Carboloy, Inc., Detroit, has formed a new southwestern sales district consisting of northern Texas, N. M., Okla., Kans., La., Ark., Ala., Miss., and western Fla. **A. J. Rod,** sales engineer in charge of the Houston branch, will serve as district manager. The following firms will act as Carboloy distributors in their area: **El Paso Saw & Belting Co.,** El Paso; **Machinery Sales & Supply Co.,** Dallas; **Murray-Baker-Frederic, Inc.,** New Orleans; and **Marshall Supply & Equipment Co.,** Tulsa.

Thompson Products, Inc., Cleveland, has reorganized its executive sales staff organization into two divisions. **Charles L. Davidson** has been appointed general sales manager for the staff sales group while **S. P. Bayless** has been named sales manager of the aircraft division and **G. R. Moore** of the automotive and commercial division.

The International Nickel Co., Inc. opened a Cincinnati technical section of its Development and Research Div. on Dec. 1. **Richard B. Kropf** is in charge of the section, which has headquarters at 1715 Carew Tower.

The **Parts Manufacturing Co.,** Los Angeles, has been purchased by the **Ellinwood Industries.**

F. J. Stokes Machine Co., Philadelphia, has appointed **Williams & Wilson, Ltd.,** Montreal, Toronto and Windsor, as its exclusive sales representative throughout Canada, east of Manitoba. **Harold G. Roman,** 564 Main St., Portland, Conn., has also been appointed representative for the firm in the New England territory.

Varady Engineering Service, industrial consultants in mechanical engineering, has been formed by **John C. Varady** in Cleveland. **Harold G. Donaldson,** formerly with the Aluminum Co. of America for 16 years, will be associated with Mr. Varady as industrial designer. Offices of the company are at 507 Western Reserve Bldg.

The **Marquette Machinery Co.** has been formed by **Walter Hannaum** and **I. Gruskin** in Detroit. It will deal in used metalworking machinery and also in appraisal work and liquidation of entire plants or single machines. Temporary offices are located at 15000 Charlevoix Ave.

Fort Pitt Spring Co., Pittsburgh, has been acquired by **H. K. Porter Co., Inc.** The new unit will be operated as the Fort Pitt Spring division and will continue under the direction of **Henry Miller,** who has been general manager for 15 years.

William J. Mericka & Co., Inc., Cleveland and **Goshia & Co.,** Toledo have purchased the controlling stock of the **Bingham Stamping Co.,** Cleveland.

Fedders Manufacturing Co., Inc., has changed its name to the **Fedders-Quigan Corp.** Also, executive offices of the firm have been moved from Buffalo to Maspeth, N. Y.

Corner Simon Associates has been organized to offer "Tailored Engineering" to industry and management. The founders of the group, **Lewis B. Simon** and **A. N. Corner,** have established offices at 475 Fifth Ave., New York City.

Cavel & Brunette Tool Co., New Britain, Conn., has changed its name to the **Brunette Tool Co.**

Electro Manufacturing Co., Chicago, has purchased the **General Electric** Lamp Department's business in rectified fluorescent equipment and Cooper Hewitt fixtures.

Woodall Industries, Inc. has purchased **Industrial Fabricators, Inc.,** Cleveland, Ohio.

Lehmann Machine Co., St. Louis, Mo., has appointed **Stanley Berg & Co.,** 521 Frick Bldg., Pittsburgh, as its representative in that territory.

Drake Industries Co., Toledo, Ohio, filed papers of incorporation on Nov. 26. Incorporated by **W. K. Fenton, E. L. Walpole** and **W. G. Christensen,** the firm will deal in tool and machine supplies.

Allegheny Ludlum Steel Corp. will acquire the **Arnold Engineering Co.,** manufacturer of permanent magnets, on Jan. 2.

The Industrial Research & Tool, Inc. has been formed with the main offices and engineering room at 136 S. Ludlow St., Dayton, Ohio, and a branch at 5946 Cermak Rd., Cicero, Ill. The firm will render specialized engineering service including consultation on production control, processing and plant layout as well as designing and building of tools, dies, gages and special machines. Incorporators are: **George D. Ludington,** president; **W. W. Anderson,** vice president; and **R. H. Deady,** secretary.

OBITUARIES

Earle L. Ferguson, 52, treasurer of the Weatherhead Co., Cleveland, died suddenly Nov. 26. Mr. Ferguson had previously been associated with the Hudson Motor Car Co.

John Younger, 63, passed away Nov. 14. Mr. Younger had recently been a member of the engineering faculty at Ohio State University and prior to that served as chief engineer of the Pierce-Arrow Motor Car Co., president of the Standard Steel Car Co., Pittsburgh, and general manager of the Standard Parts Co., Cleveland.

Charles S. Davis, 83, president and owner of the William B. Pierce Co., Buffalo, N. Y., died recently. Mr. Davis purchased the concern in 1896 and remained active in its management until his retirement three years ago.

Valentine B. Schupp, 59, recently passed away. Formerly secretary and manager of the Sizer Forge Co., Buffalo, Mr. Schupp had been a partner of Schupp and Mansfield for 21 years and served as district manager for the Erie Forge Co., Erie, Pa., and other steel companies.

Maurice A. Banks, 65, founder and for 30 years president of the National Engine Builders & Supply Corp., Buffalo, N. Y., died recently.

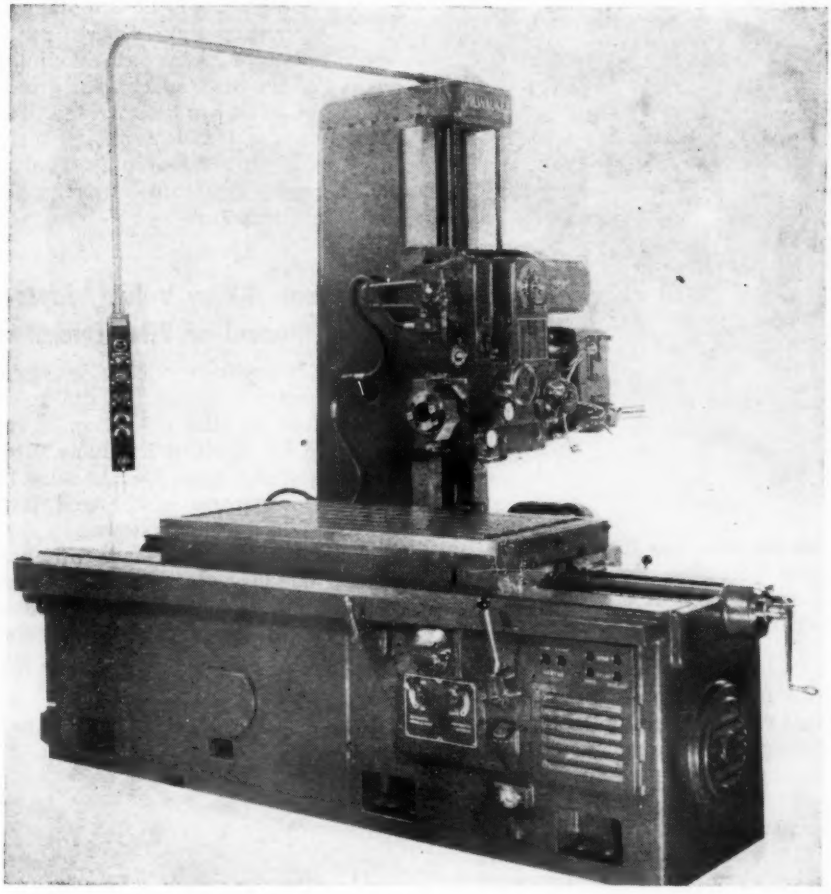
MEETINGS

National Metal Congress and National Metal Exposition. Cleveland Public Auditorium. Cleveland, Ohio. Feb. 4-8. W. H. Eisenman, managing director, 7301 Euclid Ave., Cleveland 3, Ohio.

Society of Plastic Engineers. Plastics Exhibit. Convention Hall. Detroit, Mich. Jan. 7-11. Annual meeting. Horace H. Rackham Educational Memorial. Jan. 7-9. Fred Conley, Chairman Publicity Committee, 510 Stephenson Bldg., Detroit 2, Mich.

Shop Equipment News

Milwaukee Model T Planned to Bore, Mill and Thread to Close Tolerances



Operational controls for the model T precision milling and boring machine are duplicated on opposite sides of the bed. A swiveling pendant carries electrical controls

The Kearney & Trecker Products Corp., Milwaukee, Wis., manufactures a precision milling and boring machine identified as No. 3, model T. General application of the machine includes precision milling, boring, and threading operations in one setup on special machine members, gearboxes, box jigs, fixtures, and precision production work.

The table is fully supported throughout its entire travel. Ram type construction of the spindle slide maintains alignment whether it is locked in position for milling operations or released while boring feeds are in use. A rear bearing extension eliminates overhang at the back end of the spindle ram and fully supports the attached gearbox during the entire ram travel.

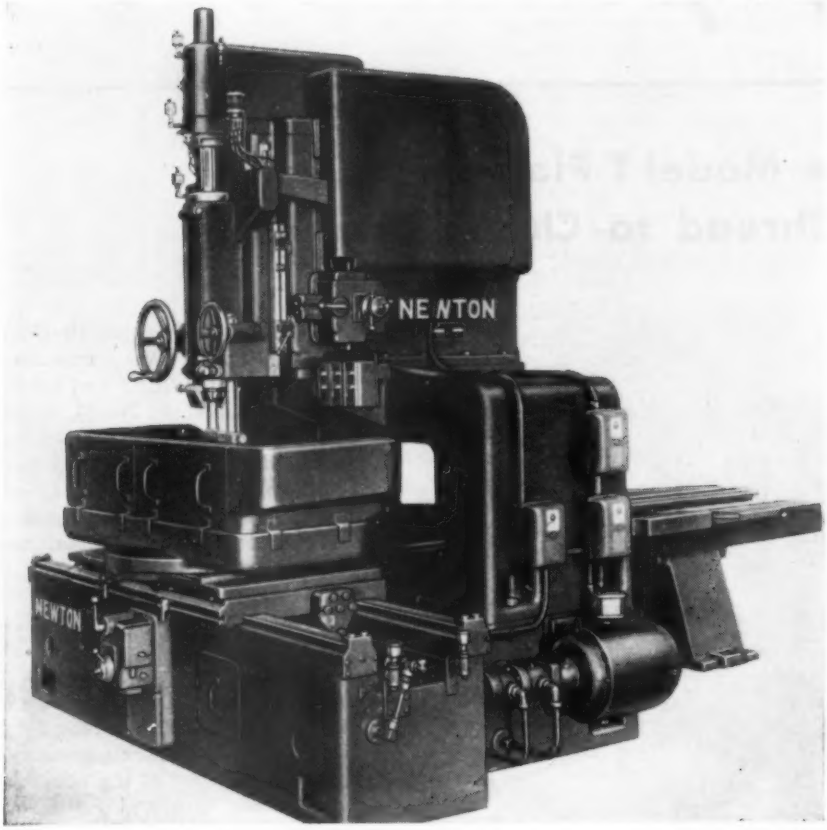
Means for complete operational control of the table have been placed on each side of the bed. Spindle rotation is electrically controlled through a swiveling pendant which contains switches for starting and stopping, forward or reverse, inching, and spindle brake. All controls for spindle speeds and boring feeds are placed in the self-contained spindle head. The entire range of spindle speeds is obtainable through a single speed-selector crank and on two-position range-change level. Boring and threading feed changes are effected through pickoff gears under a convenient cover in the spindle head.

As the longitudinal and vertical screws are used primarily for actuating the table and spindle head for milling feeds and rapid traverse, an end measuring system is supplied as standard equipment. All operation movements of the machine can be controlled to 0.0001 in. through built-in dial indicators. A four-position stop on the spindle ram facilitates step-boring operations. A drive bracket can be provided for driving 16-, 20-, and 24-in. rotary tables; if this arrangement is desired.

SPECIFICATIONS

Working surface of table	24 x 54 in.
Table travel—longitudinal (hand or power)	42 in.
Spindle head travel—vertical (hand or power)	27¾ in.
Spindle center to table top	Min.: 1¼ in.; Max.: 29 in.
Column travel (hand only)	12 in.
Face of spindle to table centerline	Min.: 1¼ in.; Max.: 25½ in.
Spindle end—National Standard	No. 50
Spindle speed range	35-1400 rpm.

Newton Radius-Link Grinders Grind Link Radii and Mating Blocks



Coolant reservoir and settling basins, of ample size, are located in the base of the Newton Radius link grinder and are accessible through conveniently located cleanout openings. The hydraulic oil reservoir is also located in the base. It has covered cleanout opening for access to the oil-pump-suction strainers

The Consolidated Machine Tool Corp., Rochester 10, N. Y., has developed a Newton heavy-duty radius-link grinding machine especially designed to grind the radii of locomotive links and mating link blocks. With an extra rotary-table attachment, internal-bushing grinding can be handled.

This machine is built with vertical oscillating grinding head and reciprocating table, both operated by hydraulic cylinders. Individual motor drive is provided to grinding spindle, and also a separate motor-pump unit for the hydraulic head and table movements. All movements are hydraulically operated. Trip dogs control the length of the table and head stroke. The rate of head and table movements is independenly adjustable while the machine is in operation.

Links to be ground are placed flat upon the table. All controls are accessible, located at a convenient height and within reach of the operator in his normal working position. Full rigidity is provided by the extra heavy radius arm and ball bearing equipped table rapidly and accurately to grind parallel the sides of the block slots in the largest links.

Provision has been made for use of either short-fast reciprocation and wide-faced wheels, or long-slow reciprocation and narrow-faced wheels. The latter method is generally preferable as it produces a generated surface with a minimum of wheel dressing, similar to that produced with a conventional surface grinder.

The Newton radius-link grinder is equipped with a precision grinding head developed especially for this type of work. The spindle is belt driven by a constant-speed, totally enclosed, ball-bearing motor. The spindlehead is fully counterweighted, and has oscillating or continuous vertical movement by hydraulic cylinder with adjustment provided for selecting the rate of head movement. The slide supporting the spindlehead is adjustable horizontally by the hand wheel at the front with the micrometer collar to facilitate final setting of depth of the grinding wheel cut. The spindle slide is gibbed to a heavy support arched to clear the radius arm that fulcrums at the rear of the machine.

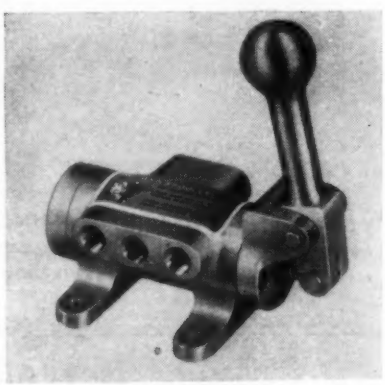
The work table has reciprocating motion by hydraulic cylinder; stroke being controlled by trip dogs. Adjustment is provided for selection of table-movement rate. Both oscillating and reciprocating motions of the spindle head and work table are operated by dual hydraulic pumps driven by one constant-speed motor.

The radius-arm fulcrum can be set for grinding links from a minimum radius of 22 in. to a maximum radius of 100 in. Capacity for grinding larger radii can be provided. The work table is 16x60 in. on its working face with a maximum travel of 36 in. providing ample capacity for handling large links.

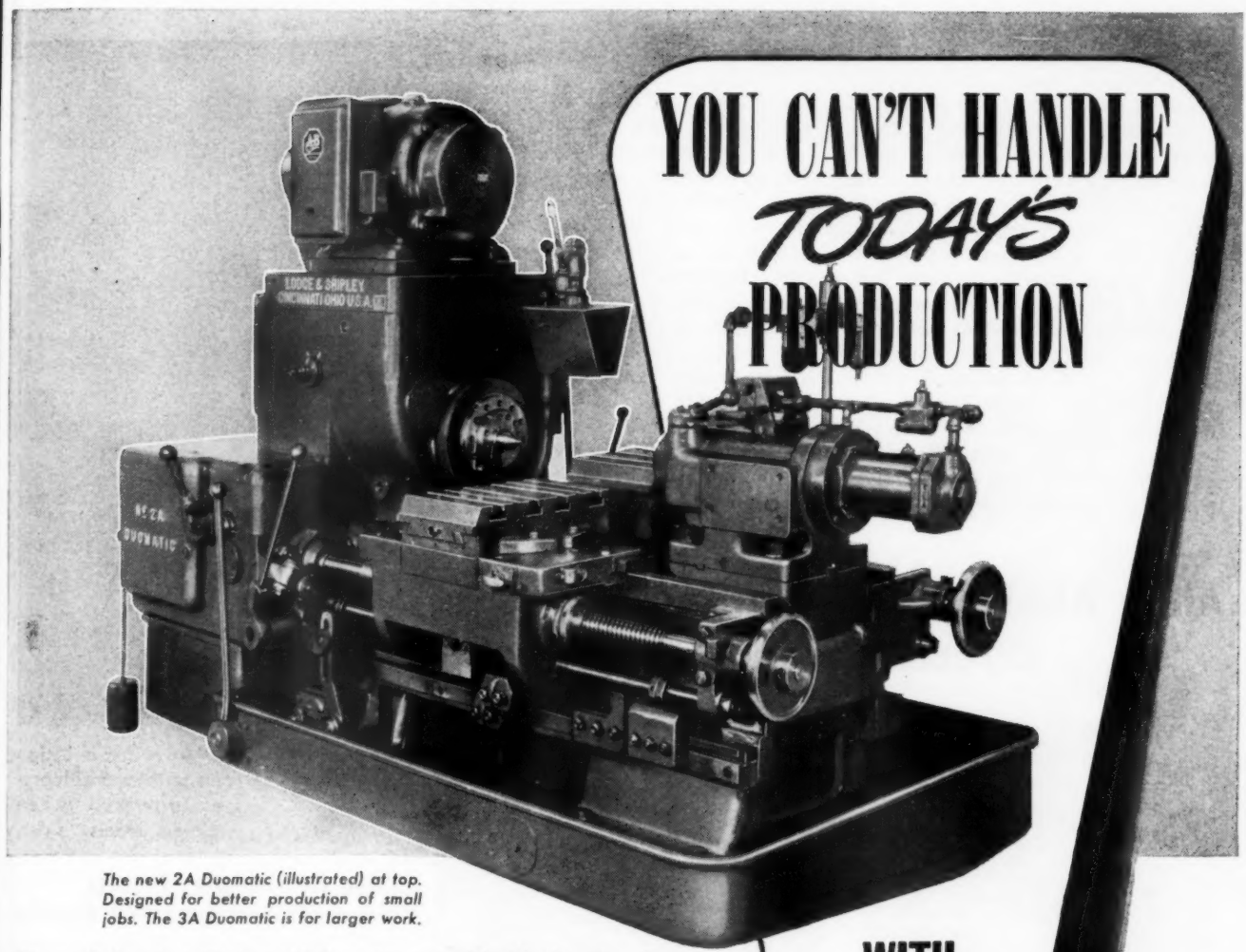
Modernair 4-Way Valve Adapts To Manual or Pilot Operation

The Modernair model CV series 4-way control valve, adaptable to hand, foot or pilot operation is announced by Modern Products, Ltd., 932 So. Grand Ave., Los Angeles 15, Calif., for control of air and low-pressure hydraulic systems.

The CV series valves are fully balanced, use aircraft type packing and are free of metal-to-metal contact between wearing parts. The design permits the transmission of full line



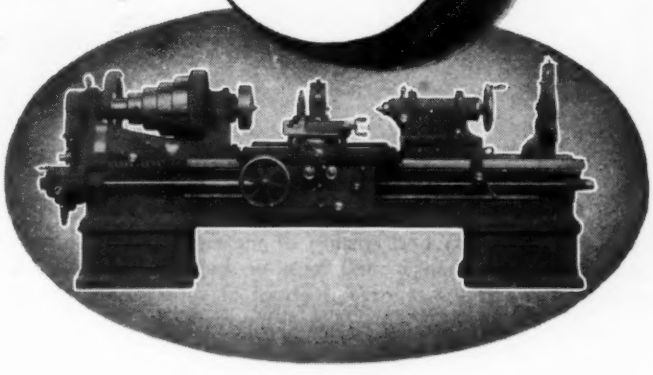
Using the same assembly of housing, piston rod and end plates, a hand-operated CV valve converts to foot operation by removing two clevis pins and replacing the hand lever with a treadle. Conversion of hand or foot operation to pilot operation involves the removal of one end plate and replacement of the piston and end plate. All of these changes may be made without breaking the line connections



YOU CAN'T HANDLE TODAY'S PRODUCTION WITH YESTERDAY'S LATHES

The new 2A Duomatic (illustrated) at top. Designed for better production of small jobs. The 3A Duomatic is for larger work.

Shown below is a 43 year-old five-step cone head lathe. You don't see many of these around any more. And for obvious reasons. The old, five-step cone head, using a friction drive, had limited horsepower because of belt slippage. Limited horsepower prevented multiple tool operation. Dependence on line shaft drives further handicapped production. All this changed completely with development of the geared head and transmission. Results were great savings in time, labor and costs.



In the same manner the new Lodge & Shipley 2A and 3A Duomatics have made the standard pre-war lathe equally old-fashioned and costly. The Duomatic has almost completely taken responsibility from the man and put it into the machine. Unskilled operators can handle one or more of these full automatic lathes with amazing ease.

Your work pieces may be large or small, your runs long or short. In any case, the new 2A or 3A Duomatics will save you time and money—help you meet the keenest competition. Investigate now. L & S Engineers can prove the practical advantages of the Duomatic on your own work . . . show you how one Duomatic may readily replace several of your old or war-worn lathes. Write for detailed bulletin Nos. 601 and 620.

THE LODGE & SHIPLEY MACHINE TOOL CO.

L & S LATHES

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.

volume and pressure through the valve, without operation being affected by variation of line pressures.

The design of the valve permits its use normally on or off in three positions, the center position being neutral. In the neutral position, when used for cylinder control, the unit may be arranged to permit positioning of the piston with pressure balanced on both sides of the piston, or with pressure relieved at both piston ends. All of the adaptations as hand, foot-or pilot-operated valves can be used as a single 3-way valve by plugging one outlet port or as two 3-way valves in series. When the unit is installed as two 3-way valves in series, one valve will have the pressure on, while the other will have the pressure off.

The valve is normally furnished with ⅜-18 NPT female ports at 1-in. spacing on centers. The valve is also available in ¾ in.-18 port size. Mounting pads are 4⅜ in. overall with 9/32-in. dia. holes on 2 13/16-in. centers. Width of the valve body, port facing to port facing, is 3⅛ in. Over-all width of the valve body is 2 7/16 in. Addition of the handle increases the over-all height to the maximum point in the handle arc to 6¾ in. by an over-all length of 7 5/16 in. Use of the treadle increases the over-all length to 10⅛ x 4 11/16 in. to the maximum height reached by the treadle.

Flux used in the Airco flux-injection process is non-combustible and combines with oxides produced when burning stainless steels

Airco Flux-Injection Process Burns Stainless Steel Rapidly

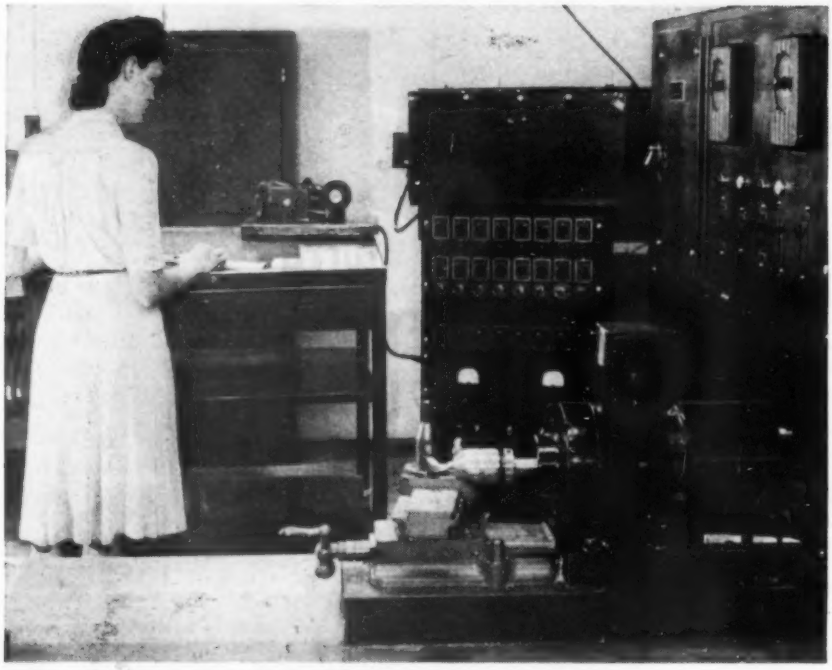
With flux-injection cutting equipment, developed by the Rustless Iron and Steel Co., and Air Reduction Co., 60 E. 42nd St., New York, N.Y., stainless steels containing as much as 50% alloying elements can be cut as readily as ordinary steel by conventional oxacetylene methods.

Any Airco standard cutting machine equipped with a modified conventional machine-cutting torch and a standard tip can utilize the system for machine-cutting stainless steels. For hand cutting, a torch adapted to deliver flux is available. As the flux-injection unit weights 75 lb. when fully charged, it is portable. The unit has a 35 lb. capacity—enough flux for five hours continuous operation—which assures a supply for one shift. No special gas lines or similar devices are required.

The hand torch built to provide flux controls has been designed to to meet requirements of riser-cutting and occasional severing. Both machine and hand torches are similar to the standard types but have been adapted to permit free flow of oxygen and flux under all conditions.

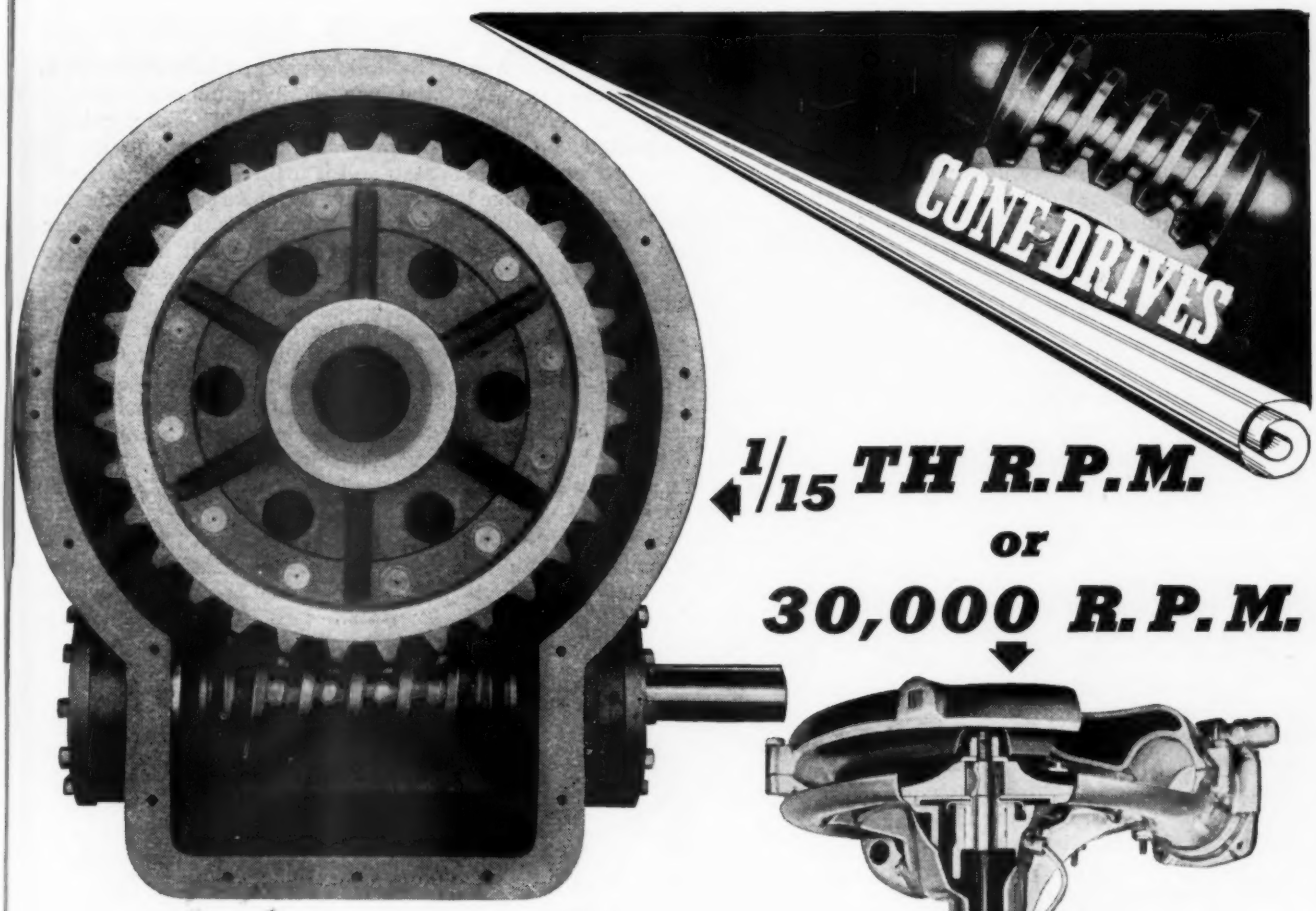
Operating conditions and instructions for stainless steel cutting are approximately the same as required for mild steel. The kerf is substan-

Alloy Analysis Time Cut by Direct-Reading Spectrometer

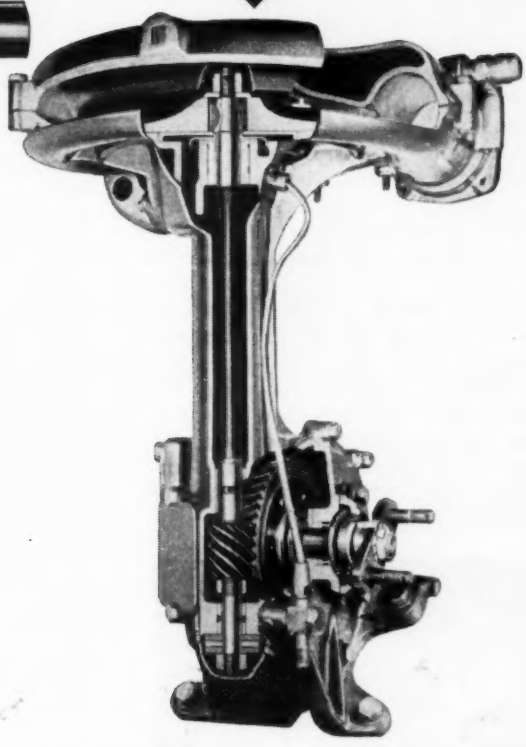


In melting, alloying and casting of metals, the Dow direct-reading spectrometer reduces the time a melt must be kept at temperature while waiting for analytical reports. Accuracy is equal or superior to that possible by spectrographic methods

An instrument which electronically measures the concentration of elements in alloys and automatically records the results has been developed by the Dow Chemical Co., Midland, Mich. This direct-reading spectrometer can make alloy analyses in 40 seconds. The substitution of an electronic method of measuring the intensity of spectrum lines eliminates the necessity for photographic and developing equipment and microphotometer, and avoids errors from film variation. Operators can be trained in a single day. The entire operation is automatic from the time the metal samples are placed in the instrument until the analysis is recorded on paper. Up to 14 elements can be determined simultaneously with this instrument.



1/15TH R.P.M. or 30,000 R.P.M.



Illustrated are (left) a 32:1 speed reducer used in a mining operation (1/15 r.p.m.—15 inch Center Distance; 918,000 in. lbs. torque). Right: a 1:4⅞ step-up supercharger drive which handles 19 hp. at 30,000 r.p.m. on a 2.675 inch center distance.

either way it's a CONE-DRIVE

Cone-Drive's advantages are not confined to any particular speed range. They are inherent in the gears themselves.

At low speeds, the tremendously greater area-contact and more teeth in contact of Cone-Drives result in vastly lower unit pressures, longer life and ability to transmit more power and torque through gears of smaller center distance.

At high speeds, Cone-Drive gearing's inherent accuracy—resulting from the exclusive method by which they are produced—means smooth quiet operation and highest efficiencies.

Yet, for a given amount of power to be transmitted, Cone-Drive gearing actually COSTS LESS. We will be glad to supply design data for your specific application.

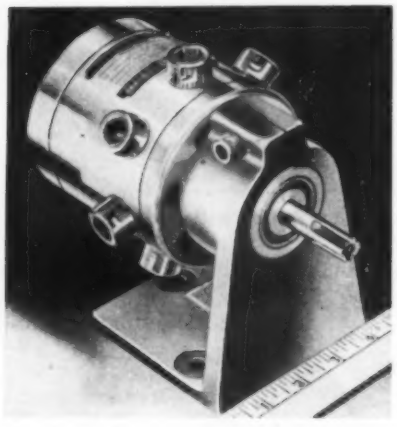
CONE-DRIVE DIVISION
MICHIGAN TOOL COMPANY
7171 E. McNichols Rd., Detroit 12, U.S.A.

tially the same and flux consumption for cutting thicknesses from 1 to 5 in. averages 1 oz. per min. of operation.

Only normal preheat—the same as required for standard cutting operations—is required.

Seco Radial Pumps Develop Fluid Pressures of 10,000 PSI

Simplex Engineering Co., Zanesville, Ohio, manufactures high pressure hydraulic pumps that utilize the principle of inherent sealing by fluid pressure and has a hollow piston to generate the fluid compression. The hollow piston functions like a cup leather except that it is made of high-grade tool steel and heat-treated to a hardness of 60 Rockwell C to give it high strength, elasticity and wearing qualities. As fluid pressure builds up inside the hollow piston, it expands and the sealing power is increased between the moving piston, cylinder wall and pump body. When pressure is released, all surfaces return to their original dimensions. Both the hollow piston and cylinder sleeve are made of heat-treated steels with high elastic physical properties and the manufactured clearances around the piston and sleeve have been reduced to a minimum; thus, deflections caused by internal fluid pressures are within the limits of these parts to expand without permanent deformation. The higher the pressure, the tighter the seal between the moving piston, cylinder sleeve and pump body, which results in high pressure without soft packing.

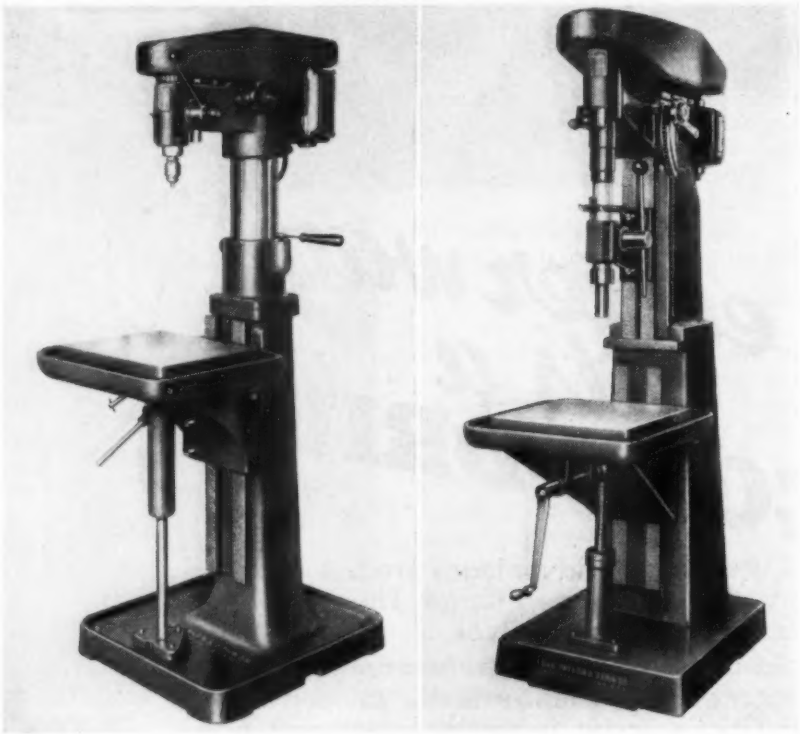


The displacement is constant per revolution in Seco pumps and they are classified as fixed displacement pumps. However, the volume discharge under pressure is closely proportional to the rpm. and they can be used for the solution of variable-displacement problems by driving from the prime mover through a variable-speed transmission

Motion is transmitted to seven piston and sleeve assemblies equally spaced radially by an eccentric shaft rigidly supported on two needle bearings, one on either side of the eccentric cam. The flanged foot of the piston bears on a third needle bearing which floats on the eccentric cam. The forces developed in moving the piston against the compressed oil are taken through a bearing with no appreciable slippage on the foot of the piston. The eccentric shaft is held in position longitudinally by a double-ball radial thrust bearing incorporated in the motor end cover plate. Adequate shaft seals are provided to prevent the intake of air around the revolving shaft when the pump is running and to prevent the leakage of oil when the pump is not in operation.

Valving of the oil to and from the hollow piston is accomplished by the use of hydraulically operated ball check valves. The inlet valve is a free-floating ball with a limiting stop and it utilizes the inertia forces generated by the reciprocating piston in which it is located. Clearances around the ball are adjusted to give minimum slippage of oil. The discharge valve is similar to the inlet valve except that it is spring loaded to insure prompt closing.

Intake characteristics of Seco radial hydraulic pumps are similar to those of centrifugal pumps. They are not self-priming and should be installed below the oil-reservoir supply where gravity will automatically keep them primed. After priming, they will maintain a vacuum of 25 in. of mercury, providing the intake line is airtight. They can be run in either direction.



No rotating parts in the Taylor & Fenn drillpresses require lubrication; all bearings are sealed and self-lubricated

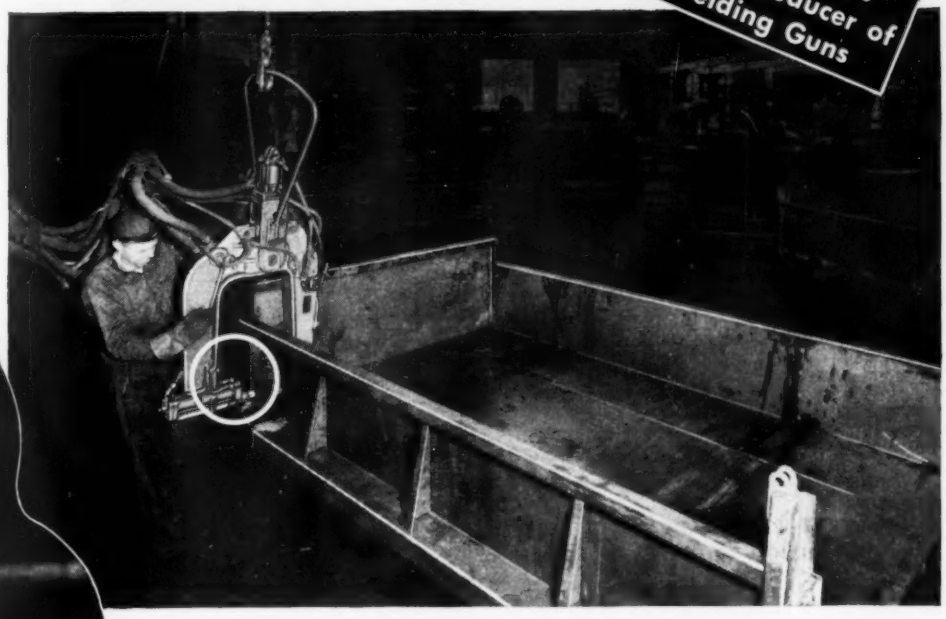
Taylor-Fenn Variable-Speed Drill Maintains Correct Cutting Speeds

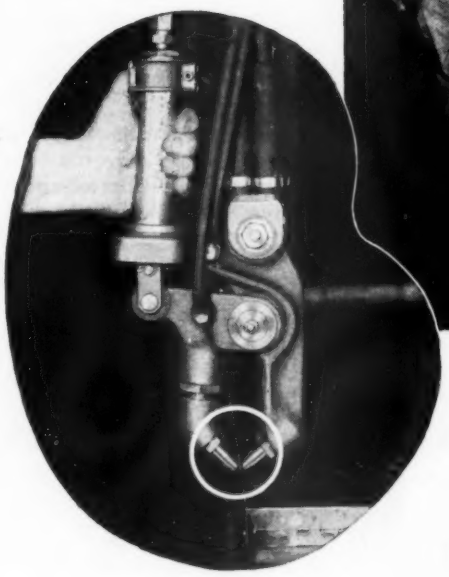
Taylor & Fenn Co., Hartford 1, Conn., announces two drilling machines, M-96 and M-125, incorporating an instant-change variable-speed unit. By moving dial setting in conformity to a reference chart mounted in front of the spindle, the exact speed for the drill used in any given material is obtained. Running at the correct speed results in higher efficiency, less breakage, more accurate work and longer tool life.

Both models are available with one to six spindles and a capacity, of ¾ in. in steel for the M-95 and ⅜ in. for the M-125.

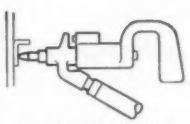
WHEN YOUR WORK IS TOO BIG . . . . . .

PROGRESSIVE is the World's largest producer of Welding Guns

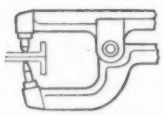




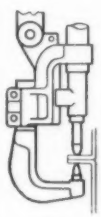
SPOT-WELD IT with PROGRESSIVE guns



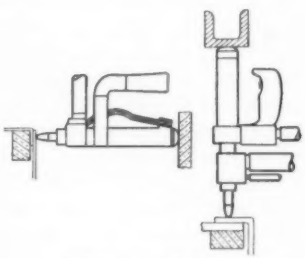
PUSH TYPE GUNS



SCISSORS TYPE GUNS



C-TYPE GUNS



EXPANSION TYPE GUNS

PROGRESSIVE, the World's largest producer of spot-welding guns, has over 700 different types of guns available to suit practically any welding requirement. This does not mean that you have to use a different gun for every job, of course, but we can quickly pick the gun best suited to your needs: scissors type guns, push guns, C-type guns, etc., with straight or offset electrodes; large guns and small guns; guns for aluminum; for stainless; guns for steels.

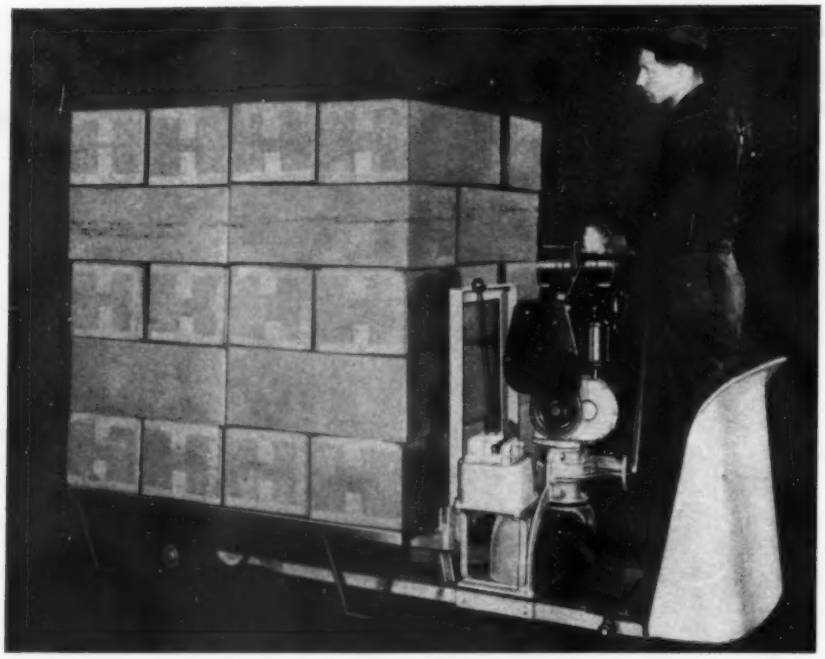
An advantage of using PROGRESSIVE welding gun equipment is that everything is overhead. The floor is clear for jigs and fixtures. Easy to handle. Easy to operate.

Have you seen a copy of the 60-page Booklet "Resistance Welding at Work"? Ask for Booklet #WP-44.

IT PAYS TO WELD

PROGRESSIVE Welder Co 3050 E. OUTER DRIVE • DETROIT 12

RESISTANCE WELDING EQUIPMENT



A gas tank of one gallon capacity provides sufficient fuel for eight hours normal operation of the Yard-Man. V-type belt brakes automatically set when the machine is not in action

Truck-Man Low Load Lift Truck Operates in Narrow Alleyways

A Truck-Man, designed for moving skidded loads of one ton or under, is announced by Yard-Man Inc., Jackson, Mich. A two-speed drive makes a low and a high speed available. The low speed is adapted for starting, climbing ramps, going in and out of freight cars or other tight places, and for moving material over rough floors. For light loads and movement without loads, the high speed is used. The Truck-Man can be turned in its own length.

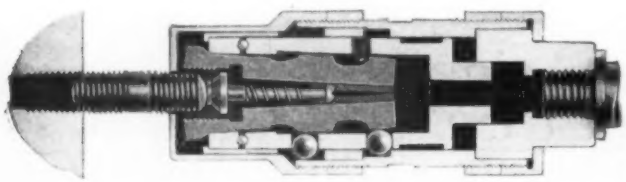
A large ball thrust bearing reduces steering effort.

Titan Automatic Stud Driver Compensates for Tool Wear

The No. 100 series automatic self-opening stud driver is manufactured by the Titan Tool Co., Fairview, Erie County, Pa. Provision has been made for automatically compensating for wear on the gripping jaws. This stud driver was designed for rugged use and to eliminate marking the stud threads. After the stud has been inserted in the holder and driven to its proper projection height, the cycle is reversed and all driving force is removed from the jaws before they are unlocked from the stud, ready to open to receive the next stud. This driver is made in four sizes to accommodate studs from 3/16 to 1 in.

Another product of the same company is the Type G reversible stud driver. This driver is designed for use either as a hand or power tool. It will drive studs where space is so limited that it would be impossible to use an automatic stud driver because of its size. A slight reversing movement of the handles releases the stud and permits the stud driver to be spun off.

All wearing parts are replaceable separately, and are made of high-alloy heat-treated steel. When used as a power tool, the handles are removed, so the driver can be adapted for use with whatever motive power is available. Adapters or shanks can be furnished to suit equipment to power the driver. This driver is made in three sizes having capacities of 7/16, 9/16, and ¾ in.



Air-Speed Pneumatic Saw Drive Operates in Close Quarters

The Air-Speed saw and filing tool driven by compressed air is a product of the Air-Speed Tool Company, 1028 W. Slauson Ave., Los Angeles 44, Calif.

Designed to simplify most sawing and filing operations, the Air-Speed tool can be worked in cramped quarters or from difficult positions. An adjustable barrel permits circular sawing in metals or woods, as well as dead-end, keyhole or scroll work. Balanced for handling and weighing 3½ lb., the tool features finger-tip speed and power control and a cutting-stroke adjustment of from ¼ to 1¼ in.

Only two internal operating parts of the Air-Speed saw are movable. The saw operates best with approximately 85 lb. pressure maintained at the tool.

Yardeny Pulsing-Drive Units Control Motor Inch Movements

A pulsing drive manufactured by Yardeny Engineering Co., 105 Chambers St., New York 7, N. Y., provides single-knob precision control of any type of reversible motor. Direction and extent of motor motion are under complete control with the knob. The motor may be continuously rotated or moved in small increments.

Slow clockwise rotation of the control knob results in a corresponding motor motion in small increments. Slow counter-clockwise rotation of the control knob causes reverse motor rotation in small increments. Either of the above operations permits the controlled mechanism to be spotted with accuracy.

Rapid rotation of the control knob causes faster motor motion and more extended travel. Fine and coarse control are incorporated. Depressing the knob and turning it slightly to right or left causes continuous forward or reverse rotation.

The Yardeny pulsing drive works on all standard currents and fre-

TRUE ECONOMY in *Thread Gaging*

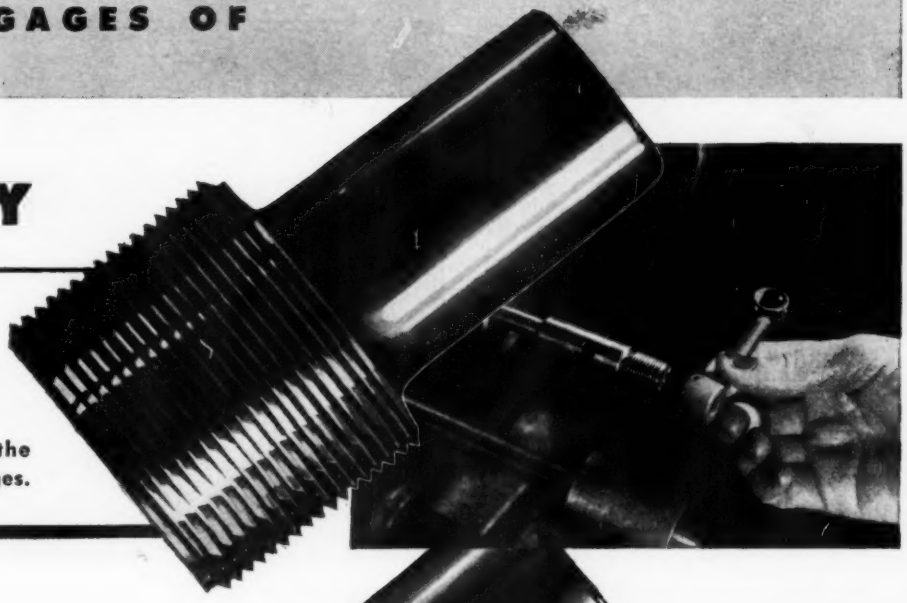
CALLS FOR GAGES OF

CARBOLOY

for

HIGH VOLUME INSPECTION

Providing at least 50 times the accurate service life of steel gages.

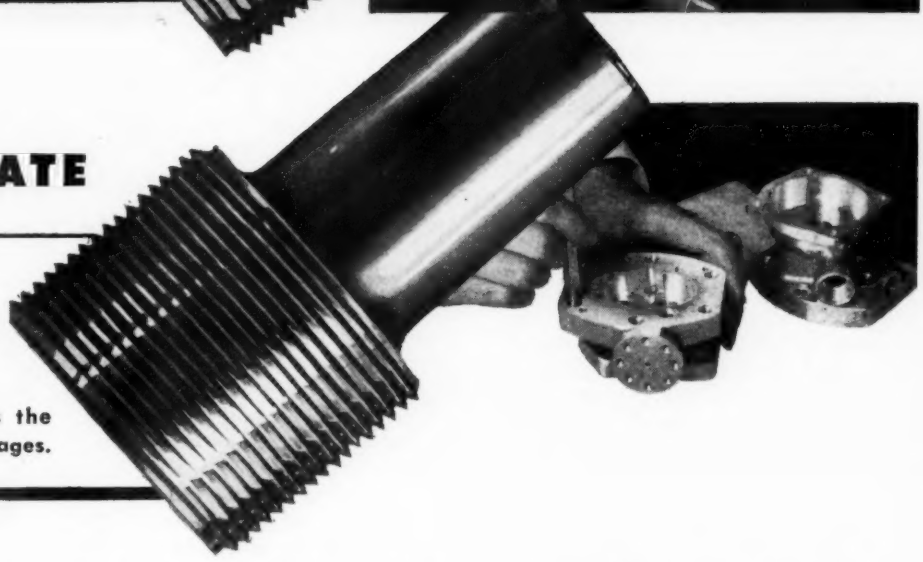


CHROME PLATE

for

AVERAGE VOLUME INSPECTION

Providing at least 5 times the accurate service life of steel gages.



WAR production proved that, in inspection of almost any volume, Lincoln Park wear-resistant thread plug gages make possible exceptional savings in gaging costs. The records of one customer using Lincoln Park Carboloy thread plug gages showed a gage cost of only 3.6 cents per hundred pieces using Carboloy gages, as compared with 19 cents per hundred pieces with steel gages. This is by no means an unusual case, but is typical of almost every instance where these gages have been used. Proportionate savings can be cited where Lincoln Park's chrome plated gages are in service.

Today, as in war-time, you'll find wear resistant thread plug gages will pay dividends in your inspection operations. And today, as in the past, Lincoln Park offers the experience and facilities to produce *the best* in gages of this type.

Lincoln Park **INDUSTRIES, INC.**

1721 FERRIS AVENUE • DETROIT 25, MICHIGAN

Yardeny pulsing drives are suitable for inclusion in controlled motor devices requiring more precise and flexible control than is afforded by pushbutton control

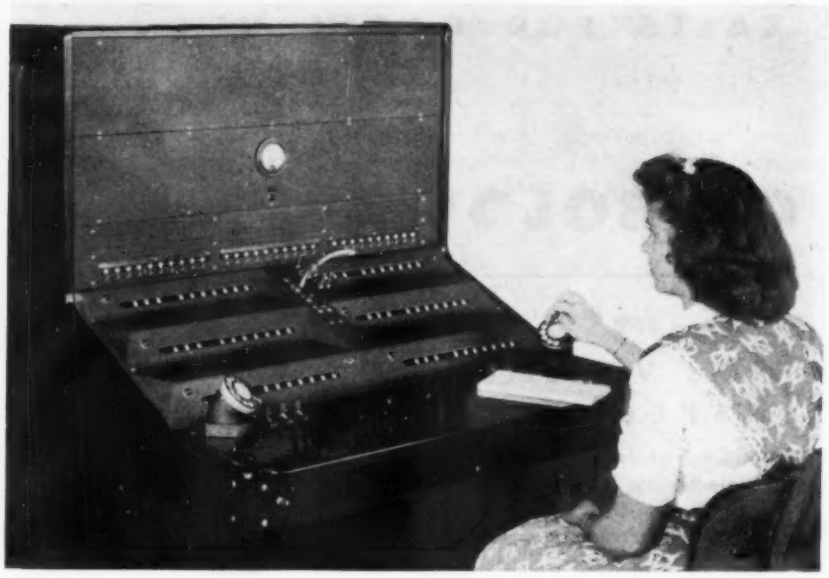
quencies. The extent of fine and coarse control provided by the unit can be made in a manner that permits quick approach and precise positioning of the controlled object.

Webster Hone Head Provides Heavy Stock Removals

Honing machines are produced in two models—a floor unit, No. RM-50, and a bench model, No. RM-50—by Webster Products Co., 1100 W. 9th St., Cleveland, Ohio. Geared-head motors, micro-expansion adjustment dial, ammeter for correct work pressure treadle-type switch and a friction clutch provide positive cutting action and heavy stock removal (0.010 in. per minute) with a fine surface finish. Oil forced out through the head and stone, while it is in operation, continually washes away grit and keeps the stones clean. The heads are made in sizes from 0.720 to 6.000 in. They have an expansion of 3/16 in. in the smaller sizes to ½ in. in larger heads.

The stones are mounted on steel stampings and can be interchanged with other sets. A calibrated nut is used on the threaded portion of the mandrel, which forces a control collar forward to expand the hone.

A series of adaptors are available so the Webster hone heads may be adapted to lathes and drillpresses



Temperator is adaptable to any size organization and to any situation where essential data must be quickly assembled. It is installed without interferring with present plant layouts

Temperator Inter-Comm System Expands Centralized Control

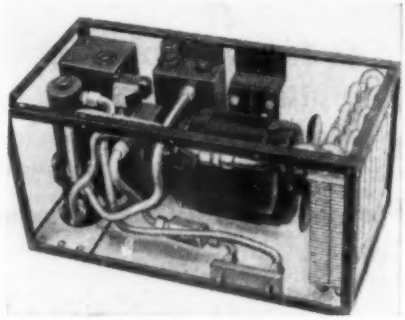
A voiceless inter-communication control known as Temperator is manufactured by Simplex Time Recorder Co., 53 Lincoln St., Gardner, Mass.

Up to four thousand messages per day—an average of one every eight seconds—may be transmitted directly to and from employees through one operator seated at a 6-unit central control board connected with any number of sub-station dispatchers.

Speed is attained through visible signal dialing. Communications are dialed as a dial telephone is used. Symbols identify each production operation, material, employee, order or lot part number. A combination of symbols delivers any desired directive or report. Symbols are flashed upon and are visible simultaneously at both central control board and any sub-station dispatcher.

Precision Collets and Fingers Include Brown & Sharpe Series

General Die and Stamping Co., 262 Mott St., New York, N.Y., announces the addition of the Brown & Sharpe series to its line of precision collets and feed fingers. The No. 00 and No. 10 collets and fingers are manufactured in all round sizes in 1/64-in. increments.



The heat-dissipating unit is 16 x 7½ x 7½ in. and is available in steel, bronze or aluminum. Other models can be built to dissipate up to 5000 watts. Smaller models can be built where the need is for a smaller unit

Process Heat-Dissipating Unit Controls Induction Heaters

A heat-dissipating unit for use in induction-heating units is announced by the Eastern Engineering Co., New Haven, Conn. It is furished complete with thermostat control, thermostatic valves and flow switch. The unit will dissipate up to 1200 watts with a constant controlled temperature, irrespective of surrounding temperature, within a close heat control range of 2° C.

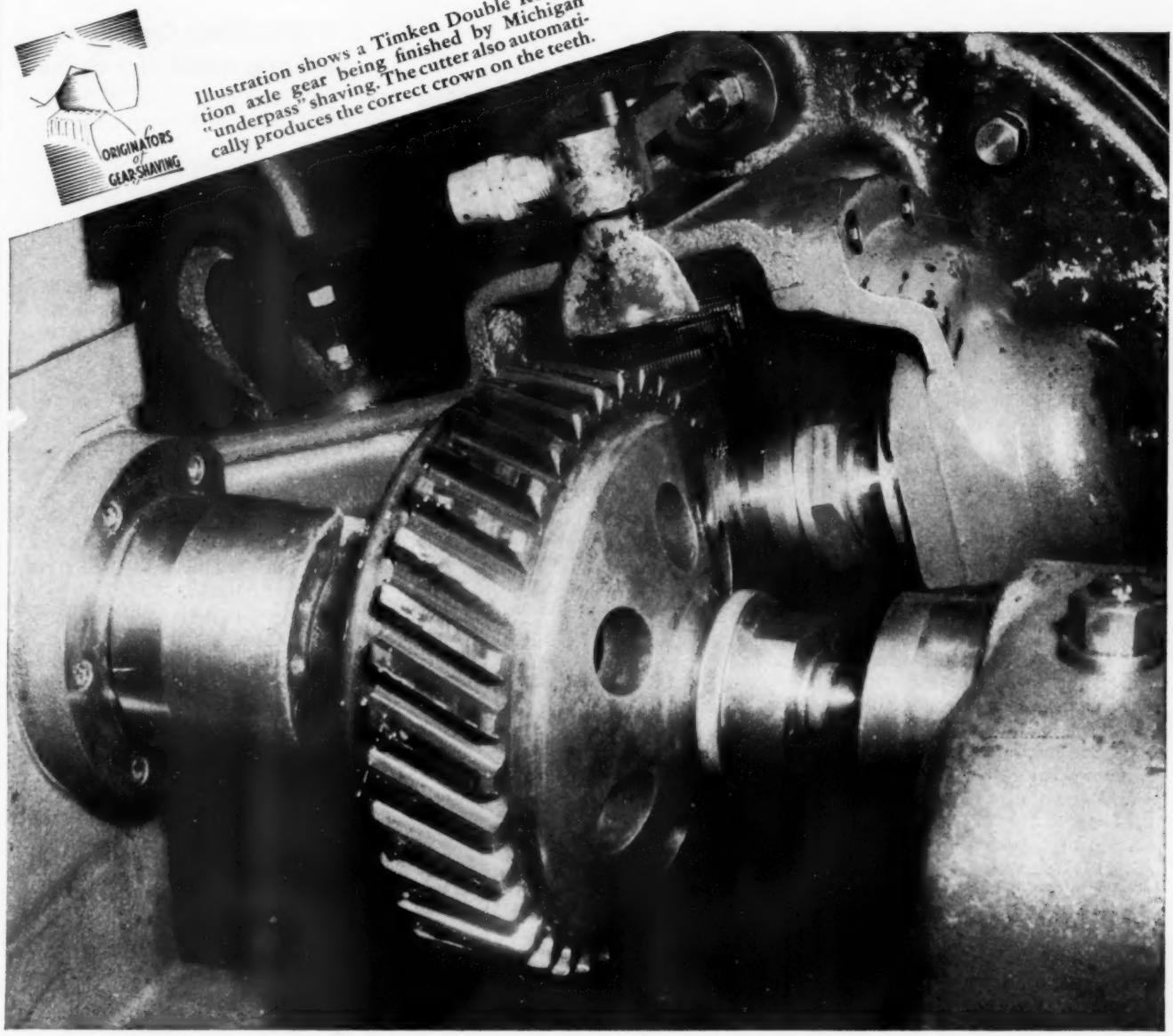


Illustration shows a Timken Double Reduction axle gear being finished by Michigan "underpass" shaving. The cutter also automatically produces the correct crown on the teeth.

Underpass Curve Shaving Boosts Gear Production 33⅓%

Sure, any kind of gear shaving is fast, but . . .

According to Wisconsin Axle Division, this Michigan 862 rotary gear finisher is producing 33⅓% more—and more uniform—gears (3½" to 16½" pitch diameters) with longer cutter life by the use of "underpass" shaving. In addition, where required, the gears are correctly curve-shaved *by the shaving cutter* at either end of the teeth.

"Underpass" shaving—exclusive on Michigan gear finishing machines—is the fastest method of producing the most accurate gears possible. In many cases a single cycle of the cutter —forward and back—is sufficient to finish a gear.

"Underpass" shaving is used interchangeably for both spur and helical gears. It is equally applicable to large as well as small gears—from ¼" to many feet in diameter.

For further information on Michigan gear finishing machines to fit your requirements, ask for "Underpass Machine Bulletins."

MICHIGAN TOOL COMPANY

7171 E. McNICHOLS ROAD DETROIT 12, U. S. A.

SIP Optical Profile Projector Projects Contours or Surfaces

The Cosa Corporation, Chrysler Building, New York, N.Y. representative for Societe Genevoise d'Instruments de Physique of Geneva, Switzerland, announces the SIP profile projector, type AP-9.

The AP-9 projects contours of parts so the image can be gaged in reference to a master drawing, measured with glass scales or photographed. The projector also can be employed for the examination of surface quality on ground and polished objects and for detecting defects in fabrics, crystals and various materials.

The screen (17¾ x 22 in.) is a clear glass plate set at a convenient angle for inspection. The part to be examined is placed on the glass table which can be rotated, while at the same time it is moved in two horizontal ordinates by a compound slide. This mounting permits quick centering of the object and facilitates the placing of its image in coincidence with a drawing or reference marks on the screen. For focusing the image, the object table is adjustable in height by means of a handwheel. Articles as large as 1¾ x 2 3/16 in. may be projected with the 10-power objective.

Illumination of the object from above, for silhouette projection, is obtained from a 100-watt lamp placed in the housing, while a 250-watt lamp provides for illumination from below for surface projection of opaque objects. Both illumination devices can be employed simultaneously for combined examination of contour and surface of objects.

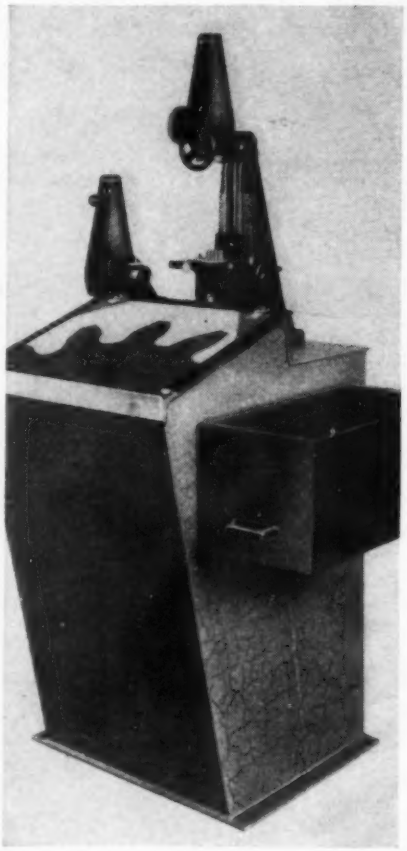
The SIP projector eliminates all shadow from the hands of the operator or the instruments he may use on the screen. This is due to the optical rays from the objectives that are thrown down to a mirror inside the cabinet and reflected upward underneath the screen, the image being made apparent by placing a sheet of tracing paper on the screen

Objectives for magnifications 10x, 20x, 50x and 100x can be supplied. Mounted on draw-tubes, they are adjusted and calibrated in the manufacturer's works and are interchangeable. The magnification ratios are guaranteed to 1/1000th of their nominal value.

Images are sharply defined and free from distortion. Their dimensions can be measured to an accuracy of 0.01 or 0.005 in. which corresponds to 0.0001 or 0.00005 in. at the object with a magnification of 100x.

Since parallel illumination is provided, the images are metrologically exact and their dimensions are independent of the thickness of the object projected and of slight errors in focusing.

Angular measurements are made with an adjustable protractor reading to 2 minutes of arc.



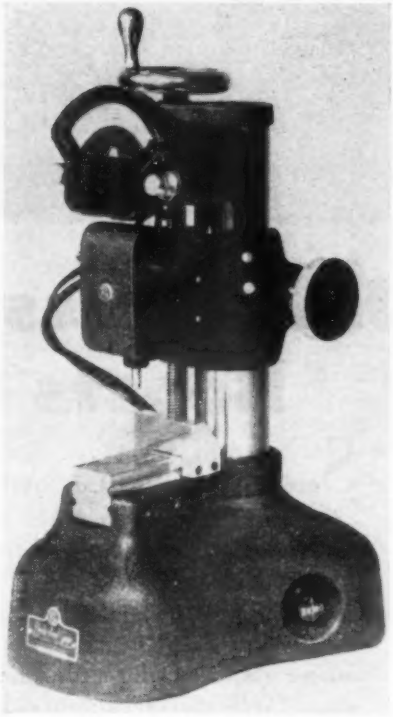
Various work-holding supports are available for the SIP projector. An inclinable center support permits mounting taps, screws, worms or milling cutters tilted to their helix angle to give a horizontal cross-section of the thread profile. A V-block can be mounted on one of the centers for accommodating small parts without centre holes, while a spring holding device is supplied to facilitate the examination of very small pinions. The images can be photographically recorded, using a plate carrier placed on the screen

P & W Electrolimit Comparator Indicates Actual Size on Dial

Pratt & Whitney, Division Niles-Bement-Pond Co., West Hartford 1, Conn. announces an Electrolimit Comparator. A P&W electric contact unit is combined with the P&W Electrolimit head to produce a unit for accurately detecting product limits. Neon-tube undersize and oversize lights are positioned at the sides of the meter, requiring only one line of vision for both the lights and the meter.

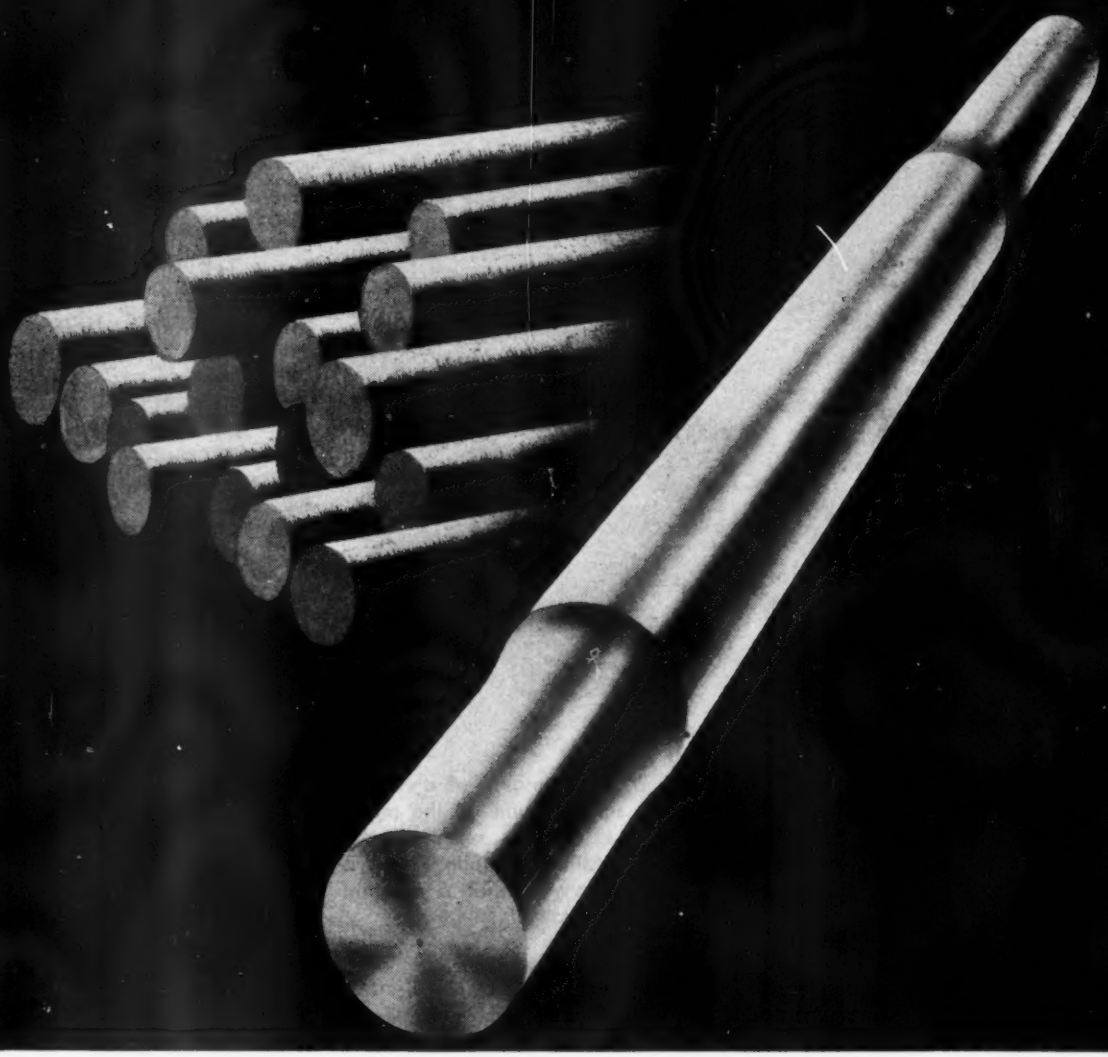
During the inspection, the operator knows whether the part is undersize, oversize or within limits by watching the limit lights. The minus light on the left, being normally on, will remain so when the part is undersize. When the part is oversize, the minus light will be turned off and the plus light on the right will flash on. When the part is within the determined limits, both lights will remain off.

Sorting of rejected parts for rework is simplified by the dial of the contact unit. When the part is rejected by the Electrolimit lights, the operator can read the exact size on the dial and place the parts for scrap or rework.



Should the operator desire to make an actual size reading of any part being checked on the Electrolimit Comparator, it is only necessary to slow up the high-speed gaging operation sufficiently to take the reading on the indicating meter

Molybdenum steel shafting has often proved its long run economy.



CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

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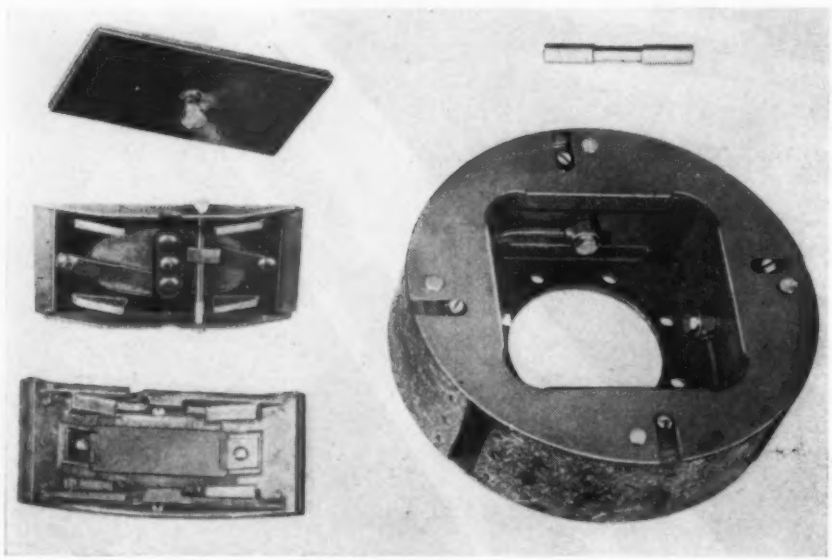
MOLY

Parts and Materials

Linderman Industrial Brake Expands Under Air Pressure



Although operated under low air pressures, only a small amount of air is required to actuate the Linderman brake due to the small volume of the multi-stage diaphragms when expanded. When required, drum is supplied with separate annular air-circulating housing to provide additional cooling. This is needed where brake applications are frequent and heavy or when a constant heavy drag is being provided by the brake

An industrial brake which operates on factory airline pressures is announced by Linderman Devices, Inc., Newburgh, N. Y.

Approximately 90% of the drum is lined and, with brake application, is pressed radially outward against the drum with the same pressure under each square inch of lining. In this manner, maximum braking effort is obtained without self-energizing action. Braking effort can be accurately and smoothly controlled, without seizing or grabbing and lining wear is evenly distributed.

The brake may be used either to stop or retard industrial equipment or to provide a constant tension or braking effort. Amount of braking effort exerted is directly proportional to the amount of air pressure applied to the actuating multi-stage diaphragms.

The entire brake is self contained. Four multi-stage diaphragms, which actuate the shoes, are interconnected to assure equalized pressure on all parts of the brake circumference. As the shoe movement is radial only, brakes may be operated in either direction with equal efficiency and equal braking effort for a given operating pressure.

The multi-stage diaphragms are made of high-grade diaphragm steel. A minimum of individual diaphragm expansion is required since shoe movement obtained is the sum of the expansions of each stage of the diaphragm.

Brake shoes have heavy steel bottoms for maximum rigidity to prevent deflection. Shoe bottoms incorporate a wedge mechanism to adjust shoes for lining wear and maintain operating clearance between lining and drum. Shoe tops are of cast iron and contain the shoe return springs.

Torque bars attached to the brake backing plate also serve as a shoe centering device, the shoe otherwise being full floating and capable of adjusting itself in operation to minor drum distortions. Axial locating of the shoe is also provided by the torque bar.

Capacity of the 14×4-in. brake size on intermittent service, for retarding or stopping, is approximately 25,000 in./lb. torque. The same brake used as a tension device will continuously absorb from 3 to 10 hp. depending on shaft speed and cooling provided. This rating is based on drum temperatures not exceeding 475 F.

Ohio Flow Gage Eliminates Mechanical Linkage to Dial

The Ohio Pattern Works and Foundry Co., Cincinnati 25, Ohio, are the manufacturers of a fluid flow gage so constructed that the flow indicating mechanism is never in contact with the fluid. Actuation of the external indicator is by means of a magnetic flux induced by an Alnico magnetic bar. The bar is held in the movable actuating mechanism, submerged in the fluid medium, and causes the magnetically responsive, visible indicator to move in conformance with the movements of the Alnico bar.

As the indicator is not mechanically connected with the actuating mechanism within the fluid chamber, friction, stuffing-box leakage or fluid transparency are not factors affecting the accuracy of readings taken from the gage.

Although standard calibration of the dial face is intended to indicate a self-comparative rate of flow, the gage can be equipped to indicate true flow rates of materials having a specific viscosity. Or, with materials having a constant flow and fluc-

Nothing Rolls Like a Ball . . .

. . . and that fundamental fact has just struck the piano player!

Machine designers, too, have been impressed by that fact. A ball has no ends, needs no artificially fixed axis of rotation. It is nature's favorite, strongest form.

Hence the *ball* bearing. It carries the loads on free-rolling steel balls. It is just *naturally* adapted to our new world of high speeds, heavier loads and ever greater precision.

This is proved by New Departure Ball Bearings in hundreds of millions of applications on land, at sea, in the air—and in every corner of the world.

The engineering experience and meticulous manufacturing methods of New Departure, world's largest maker of ball bearings, can be of great advantage to you.

There is more for you in New Departure Ball Bearings than steel and precision. Advanced engineering and a desire to serve are tangible plus values.

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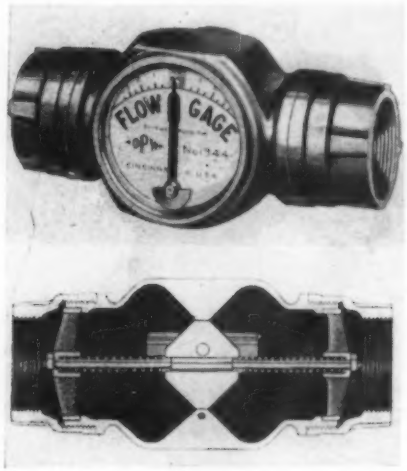
NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN. • Branches in DETROIT • CHICAGO • LOS ANGELES and Other Principal Cities

tuating viscosity, the viscosity variations can be indicated.

The flow gage can be provided in sizes from ½ to 2 in. I.P.S.



Absence of mechanical contact with the fluid flow eliminates rotational friction and stuffing-box leakage in the Ohio magnetic flow gage

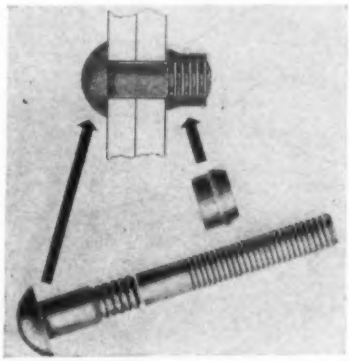
Huck-Lockbolt Fasteners Permanently Lock in Place

The Lockbolt fastener is announced by Huck Mfg. Co., 2480 Bellevue Ave., Detroit, Mich. The Lockbolt first draws the work together in the equivalent of a bolting-up operation, fills the hole completely when required, then is locked like a rivet.

The gun squeezes the work together between the collar and the head of the pin; wire-draws the pin to a press fit in the hole when hole filling is required; swages the collar into the locking grooves in the pin; breaks the pin off flush with the collar; and frees itself from the swaged collar. Both hand-operated and pneumatic guns are available.

Tensile strength is comparable to that of bolts, shear strength equals that of rivets, and liberal hole-size tolerance is allowed.

They can be furnished in 3/16-in. dia. with grip lengths ranging from 1/32 to 21/32 in. Materials include 24ST and 75ST aluminum alloy, carbon steel, and high-strength alloy steel.



Huck Lockbolts are available in two types: (1) for applications requiring hole filling (to replace rivets and close-fitting bolts), and (2) to replace bolts in clearance holes

A perforated metal grill protects the tubes. Rectifiers can be supplied with or without filtering in the dc.

Mellaphone Rectifiers Adjust Voltage with Transformers

A line of rectifiers having the dc. output voltage variable from zero to full voltage, is available from the Mellaphone Corp., Rochester 2, N.Y. The rectifiers can be connected to any specified ac. power line to deliver direct current suitable for industrial or laboratory applications, as required.

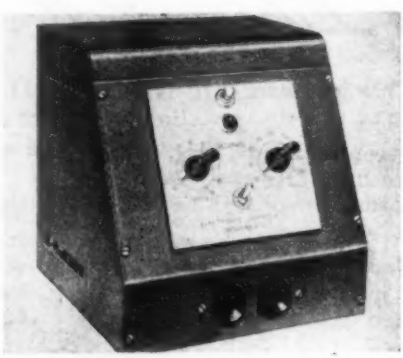
Control of the dc. voltage is obtained by regulating the knob on the front panel. Voltage regulation of these rectifiers is claimed good, as a result of use of adjustable-voltage transformers and mercury-vapor rectifier tubes. Mounting of the tubes outside the main housing provides proper cooling and freedom from arc-back. Filtering in the direct current can be provided if required for the particular installation.

Electronic Interval Timer Holds Timing Accuracy to 5%

Electronic Controls, Inc., 44 Summer Ave., Newark 4, N.J., announces an electronic timer suitable for highly accurate circuit timing.

Time range is from 1 to 120 seconds in increments of one second. Accuracy is better than 5%. Two dials are provided for time selection. One dial is calibrated in single seconds; the other in 10-second steps. Dials control tap switches. Snap-positioning step-switches assure precision control, with exact values of resistance inserted at each position. A pilot light, toggle on-off switch and a push-switch are included.

A double receptacle permits timing two circuits simultaneously. Contacts are normally wired SPDT with double break and are rated at 25 amps 32 volts dc., 25 amps 125 volts ac., and 10 amps 230 volts ac. Contacts can be wired DPDT at correspondingly lower rating.



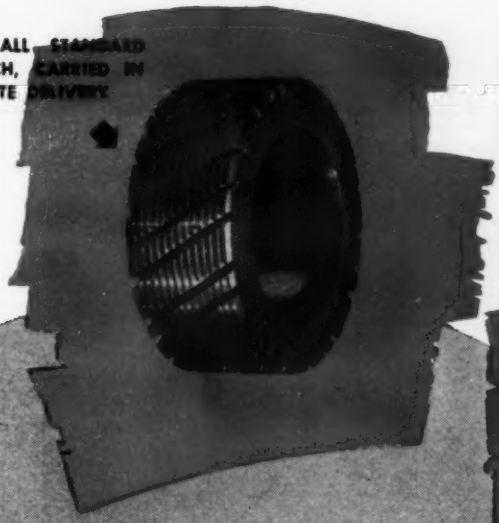
Cabinet size of the Electronic interval timer is 8x8x8 in. Tube used is a 2050 thyratron. High-accuracy resistors assure precise timing and timing is independent of the length of time the tripping push button is depressed. Dial switch is provided with a position for continuous circuit closure. The unit is supplied for 115 volts ac. operation

Large Cherry Rivets Installed With Heavy-Duty Pull Gun

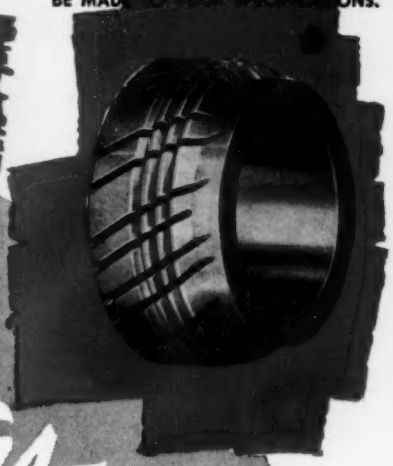
Three larger-diameter blind rivets, 7/32, ¼ and 9/32 in., are manufactured by the Cherry Rivet Co., 231 Winston St., Los Angeles 13, Calif. These rivets are available in the three standard Cherry rivet types, self-plugging, regular hollow and pull-through hollow; in modified brazier and 100° countersunk heads; in A17ST or 56S aluminum alloy and in steel.

To install the larger rivets, a pneumatic-hydraulic Cherry rivet gun, the G-40 is manufactured. It operated on 75 to 90 lb. air-line pressure, is 13 in. high and weighs 7 lb. The gun is balanced for one-hand use in any position.

CRUSHER ROLLS FOR ALL STANDARD THREADS 8 TO 32 PITCH, CARRIED IN STOCK FOR IMMEDIATE DELIVERY



CRUSHER ROLLS FOR SPECIAL THREADS AND ANY TYPE OF PRECISION FORM CAN BE MADE TO YOUR SPECIFICATIONS.

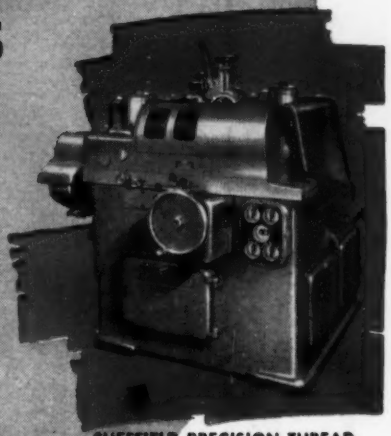


POWER CRUSHING DEVICE FOR USE ON A SURFACE GRINDER.

Headquarters

FOR CRUSH DRESSING EQUIPMENT FOR THREADS and FORMS

Grinding with crush dressed wheels has so many advantages from the standpoints of accuracy, speed, and economy that it took little time for it to become firmly established in the metal working industry. Sheffield, the American pioneer of this practice on a commercial basis, can furnish you with the equipment you need to put it into operation in your own plant.



SHEFFIELD PRECISION THREAD AND FORM GRINDER FOR DUPLICATING CRUSHER ROLLS AND THE MASS PRODUCTION OF WORK PARTS THREADED OR FORMED.

POWER CRUSHING DEVICE FOR USE ON THE SHEFFIELD THREAD AND FORM GRINDER FOR THE ACCURATE CRUSHING OF WHEELS.

SHEFFIELD MICRO-FORM GRINDER FOR PRODUCING THE ORIGINAL CRUSHER ROLL, FLAT OR CIRCULAR FORM TOOLS AND PROFILES OF ALL KINDS.

THE SHEFFIELD CORPORATION

Dayton 1, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICE

SHEFFIELD MASTER CRAFTSMEN

WENDT-SONIS CARBIDE TIPPED Universal Fly Cutter

- **NOW YOU CAN HANDLE 3 OUT OF 4** step milling and ordinary milling jobs with this one cutter.
- **IMPROVED BLADE DESIGN** requires *less* horsepower than ordinary cutters.
- **BLADES ARE STANDARDIZED** and stocked by W-S Distributors. Resharpen on bench grinder.
- **REFER TO "TOOLS"** in your Classified Directory for local W-S Distributor or write Wendt-Sonis Company, Hannibal, Missouri. Branch Warehouse: Long Beach, California.

1 HOLDER mills all materials

Four Sets of Blades Make Holder Easily Adaptable

Free!

W-S SPEED and FEED CALCULATOR for Carbide Cutters — Gives correct feed per tooth per r.p.m. Also gives basic rough and finish cuts for all materials. Write on business letterhead for your FREE Wendt-Sonis Calculator.

W-S FACTORY TRAINING COURSE, *FREE!* One week's intensive training, at our factory, in application, use and maintenance of carbide cutting tools. Small classes, individual instruction. Practical facts, actual shop practice. Write for details.

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CARBIDE TIPPED CUTTING TOOLS

BORING TOOLS • CENTERS • COUNTERBORES • SPOTFACERS • CUT-OFF TOOLS • DRILLS • END MILLS • FLY CUTTERS • TOOL BITS • MILLING CUTTERS • REAMERS • ROLLER TURNING TOOLS • SPECIAL TOOLS

TRADE PUBLICATIONS

Air and Liquid Nozzles—22-page booklet, Lonn rubber blow and spray guns and water savers, explains the principle of Lonn valves which give constant fingertip control of air or water under pressure without the use of levers, springs, push buttons, packings or screws. The booklet contains charts which show the cost of air or water delivered through various sized orifices when uncontrolled. When the Lonn gun is used, savings are accomplished.—The B. F. Goodrich Co., Akron, Ohio.

Boring Chuck—A 6-page catalog completely describes and includes specifications of a new boring chuck with which you can center drill a hole, bore a hole and then drill again without removing the boring chuck.—DeSoto Tool Co., 16 Sproat, Detroit 1, Mich.

Buffing—24-page manual on industrial finishing compounds tells when and where to use the many types which are available. The manual is titled "Polishing, Buffing and Deburring."—Industrial Finishing Div., Dept. 1, McAleer Mfg. Co., Rochester, Mich.

Centralized Lubricating Systems—Circular 76, entitled "When You Reconvert — Install Modern Lubrication." Farval Corporation, Cleveland, Ohio.

Fractional-Horsepower Drives—Catalogue on fractional-horsepower Wedgebelt drives. American Pulley Co., Department 632, 4200 Wissahickon Ave., Philadelphia 29, Pa.

Gravity Conveyors—Catalog C-142C contains information concerning construction features and uses of the 8 rapid-wheel conveyor models available, together with complete specifications and data on standard accessories manufactured for use with the conveyors. The catalog also shows on-the-spot photos of rapid-wheel gravity conveyors in action on all types of conveying jobs.—Rapids-Standard Co., Inc., Grand Rapids 2, Mich.

Greasing—Technical data bulletin A-352 entitled "How Surface Chemistry Can Speed Up and Simplify Diesel Engine Overhaul" describes fast, simple methods of removing carbon, grease, oil, asphalt and tar preparatory to equipment overhaul.

—Turco Products, Inc., 6135 South Central Ave., Los Angeles 1, Calif.

Heating Controls—Service and Instruction manual on the B-60 all gas control system describes the special valves and thermocouples used. A pilot burner activates a chain of thermocouples providing all the electric power required. Gas valves are self-activated.—General Controls Co., 801 Allen Ave., Glendale 1, Calif.

Hydraulics—New bulletin "Sundstrand Hydraulic Pumping Unit for Both Low Pressure—Large Volume, High Pressure—Small Volume" contains illustrations, description of operating principles, features, applications and engineering data for this hydraulic pumping unit.—Sundstrand Machine Tool Co., Pump Div., Rockford, Ill.

Hydraulic Control Equipment—Bulletin describing a new follow-up selector valve for the precise control of remote elements. Electrol, Inc., Kingston, N. Y.

Hydraulic Presses—Bulletin 4500 contains 84 pages describing all-hydraulic presses from 1 to 5000 tons for every industry. Included are metal working, forming and stretching presses, forging presses, powder metallurgy and plastic-molding presses and bending and forcing presses.—The Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

Infrared Heating—Three circulars give details on many types of radiant-energy heaters. Both clear and reflector bulbs are used, and in all cases reflector surfaces are gold plated for highest efficiency.—The Fostoria Pressed Steel Corp., Fostoria, Ohio.

Induction Furnaces—16-page bulletin No. 26 describes high-speed, precision melting of non-ferrous metal induction furnaces. Of particular value are helpful hints in planning an efficient foundry, and a table showing proper equipment to maintain any given production schedule with various metals and alloys.—Ajax Electrothermic Corp., Trenton 5, N. J.

Oxidizing Aluminum and its Alloys—Bulletin on "Alumox," a process for chemically oxidizing aluminum and its alloys. Enthone Co., Department M, 442 Elm St., New Haven, Conn.

Resistance Welding—Pocket catalog SP-1 contains pictures and facts per-

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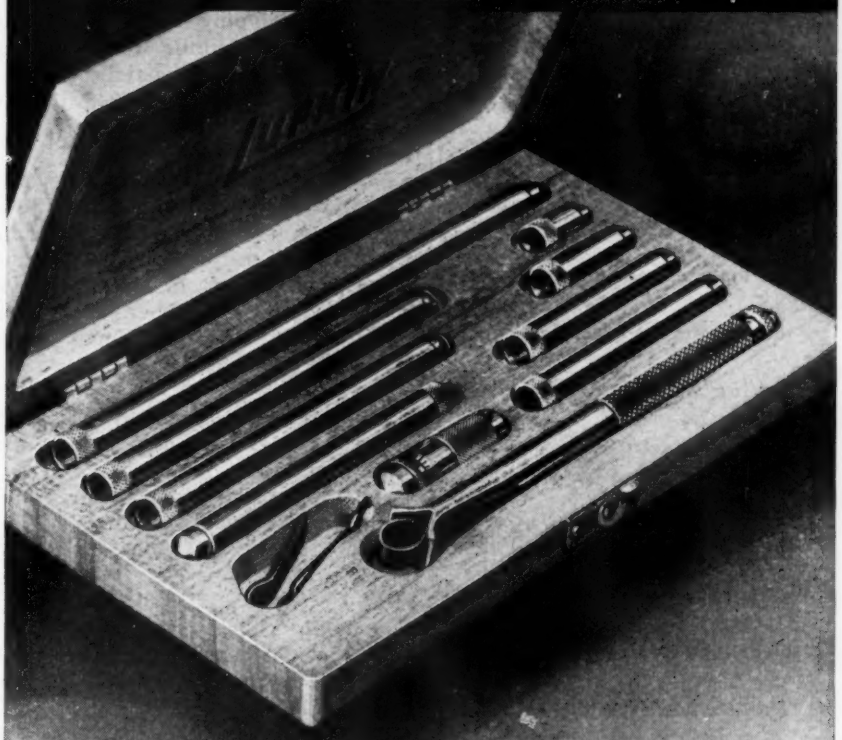

Any toolmaker would be proud to own a set of Lufkin Inside Micrometer Calipers. For taking exact inside measurements they surely do the job.

Light-weight, rigid measuring rods fit onto either or both ends of micrometer head. Thus you may center the head to maintain proper balance and "feel", and also have it in position for easy reading.

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Band Saw Blades

These Capewell Metal Cutting Band Saw Blades cut faster and last longer. To demonstrate that these blades are unsurpassed for cutting efficiency, we welcome competitive tests.

They include flexible back blades with hard teeth, contour saw blades, and spring temper blades. They are furnished cut to length and in coils, with 100 foot contour stock in a tangle-proof box.

ASK FOR THIS CHART

Ask your Capewell Distributor for this *Chart* to save time and to secure maximum life from your Band Saw Blades.

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taining to different types of resistance welders. Included are flash-butt welders, spot welders, seam welders, and bench and portable welders.—The Taylor-Winfield Corp., Warren, Ohio.

Sheaves—Catalog section 2185 is a 2-page spread giving size data, prices and weights of stock cast-iron, single and double groove FHP sheaves for V-belt drive.—The B. F. Goodrich Co., Akron, Ohio.

Spring Stripping Units—Catalogue S, on spring units for stripping metal from conventional dies. Wales-Strippit Corporation, 345 Payne Ave., North Tonawanda, N. Y.

Synthetic Rubber Molding—"Mechanical Molded Parts of Synthetic Rubber" is a 32-page engineering handbook on the applications and procedures used in making parts from synthetic rubber.—Aero-Seal Rubber Products, 113 North Green St., Chicago 7, Ill.

Tool Steels—"Hammered Tool Steels and Forgings" is a new catalog giving applications, analysis, hardening and tempering temperatures for specific Rockwell hardness of 15 types of steel.—McInnes Steel Co., Corry, Pa.

Variable Speed Transmission—Booklet describes line of adjustable cone-pulley speed changers.—Reeves Pulley Co., Columbus, Ind.

Wire Cloth—Bulletin No. 80 is a 4-page circular giving general data on the wide range of screens available and mentions a 75-page catalog on wire cloths and a 140-page catalog on conveyor belts—The Cambridge Wire Cloth Co., Cambridge, Md.

Plastics

THREE OUT OF FIVE machinery, equipment and parts manufacturers are using plastics, according to a recent McGraw-Hill survey. Of these 65% are increasing applications, only 3% reducing them. Among nonusers, 29% anticipate applications. Arguments in favor: Machinability, low unit cost, durability, ligh weight, appearance, acoustic, dielectric and thermal properties. Arguments against: thermal qualities, unit cost, durability, tensile strength. Here is the difference of opinion that makes horse-racing so interesting, plus indications that our common industry, Metalworking, is well on its way towards the tongue-twisting designation of "Materialsworking."

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TOOLS
also make friends

Vast throngs of new shop workers, trained in war industries, used "Yankee" Fine Mechanics' Tools for the first time . . . mastered fresh trade skills which will stand them in good stead in the vital production period ahead. They have learned what skilled mechanics and old-time factory men long knew . . . that "Yankee" Tools complete innumerable tasks *faster*, *easier*, and *better*. For half a century, the ingenuity of "Yankee" Tools has set a high record in speed and accuracy. The war served to underscore that record.

Order from your industrial supply distributor, or write North Bros. Mfg. Co., Dept. AM-1245, Philadelphia, Penna.

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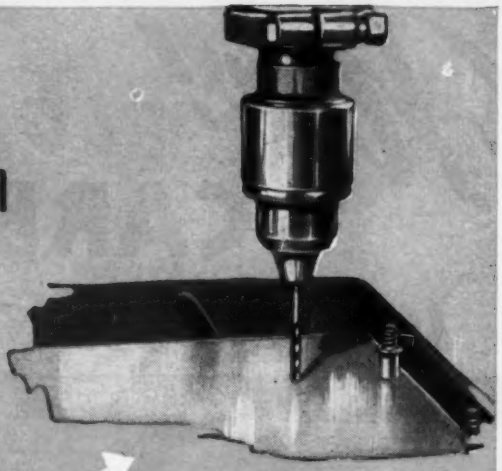
How magnesium is speeding production

because it's easy to work!



Many a firm goes to magnesium for its unique *lightness* . . . and then chalks up additional boosts in production because it's so *easy to work*. Modern plants that use magnesium find it saves time, labor, and tools through this exceptional workability.

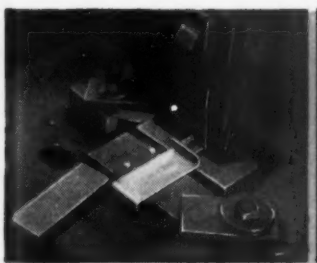
Magnesium is easy to saw, with band and circular saws and also hand and power hack saws. It permits larger cuts per tooth than other structural metals. And it can be worked faster and easier than most metals by hand tools—chipping tools, drills, burrs, chisels, planes, and portable milling cutters.

As the first step toward applying these important economies to your own product, you need only get in touch with the nearest Dow office. Technical consultants are at your service.

Ready . . . to make products move!

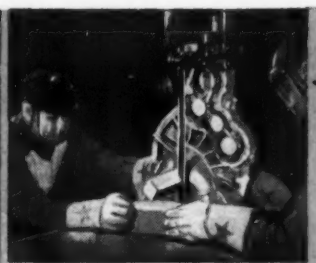
MAGNESIUM

LIGHTEST OF ALL STRUCTURAL METALS

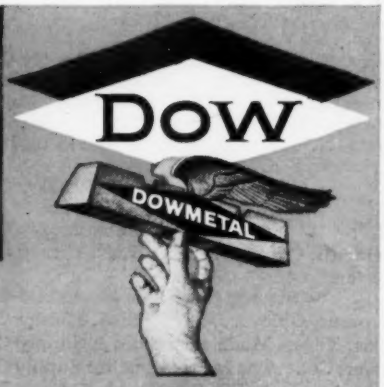


Magnesium forming methods are similar to those used with other metals, except that magnesium is usually formed hot.

Excellent machinability of magnesium speeds work with hand tools, such as the chipping operation on this magnesium casting.



Sawing magnesium, with low cutting pressures, requires only one-tenth the power that is needed for sawing steel.



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TRADEMARK

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Call upon these men, too, for expert advice on carbide tool application or maintenance problems—they've been factory-trained to aid you.

And these fast, easy-to-apply carbides are accumulating an amazing history of diversified uses. Let Carboloy's representatives help get you the full benefit of *faster* output, *lower* production costs—throughout your plant—with Carboloy Cemented Carbides.

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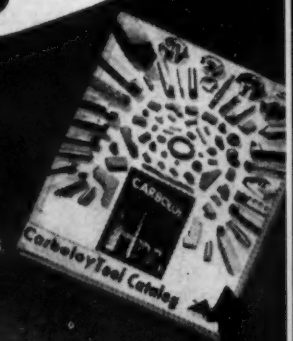

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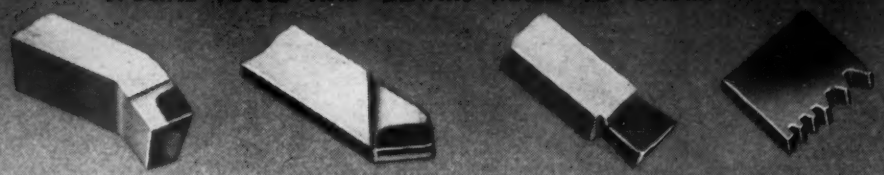

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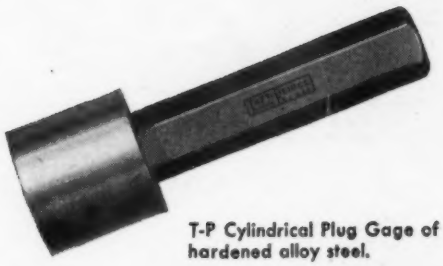
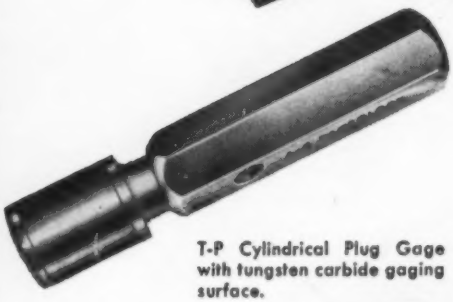
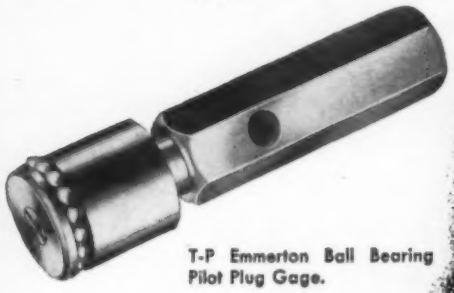


T-P Cylindrical Plug Gage of hardened alloy steel.

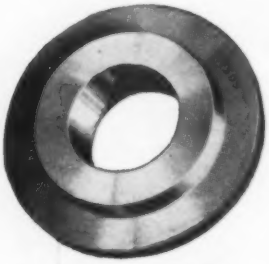


T-P Cylindrical Plug Gage with tungsten carbide gaging surface.



T-P Emmerton Ball Bearing Pilot Plug Gage.

T-P Style 9324 AGD Solid-Type External Ring Gage of hardened alloy steel.



T-P Style 9324 AGD Flange-Type External Ring Gage of hardened alloy steel.

T-P Plain Cylindrical Plug Gage with gaging surface of Norbide*.

T-P External Ring Gage with inset gaging surface of Norbide* or tungsten carbide.

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You can get prompt deliveries on standard sizes of all AGD and special types of plain plug and ring gages . . . in hardened alloy steel and chrome plate, or with gaging surfaces of Norbide* and cemented carbide.

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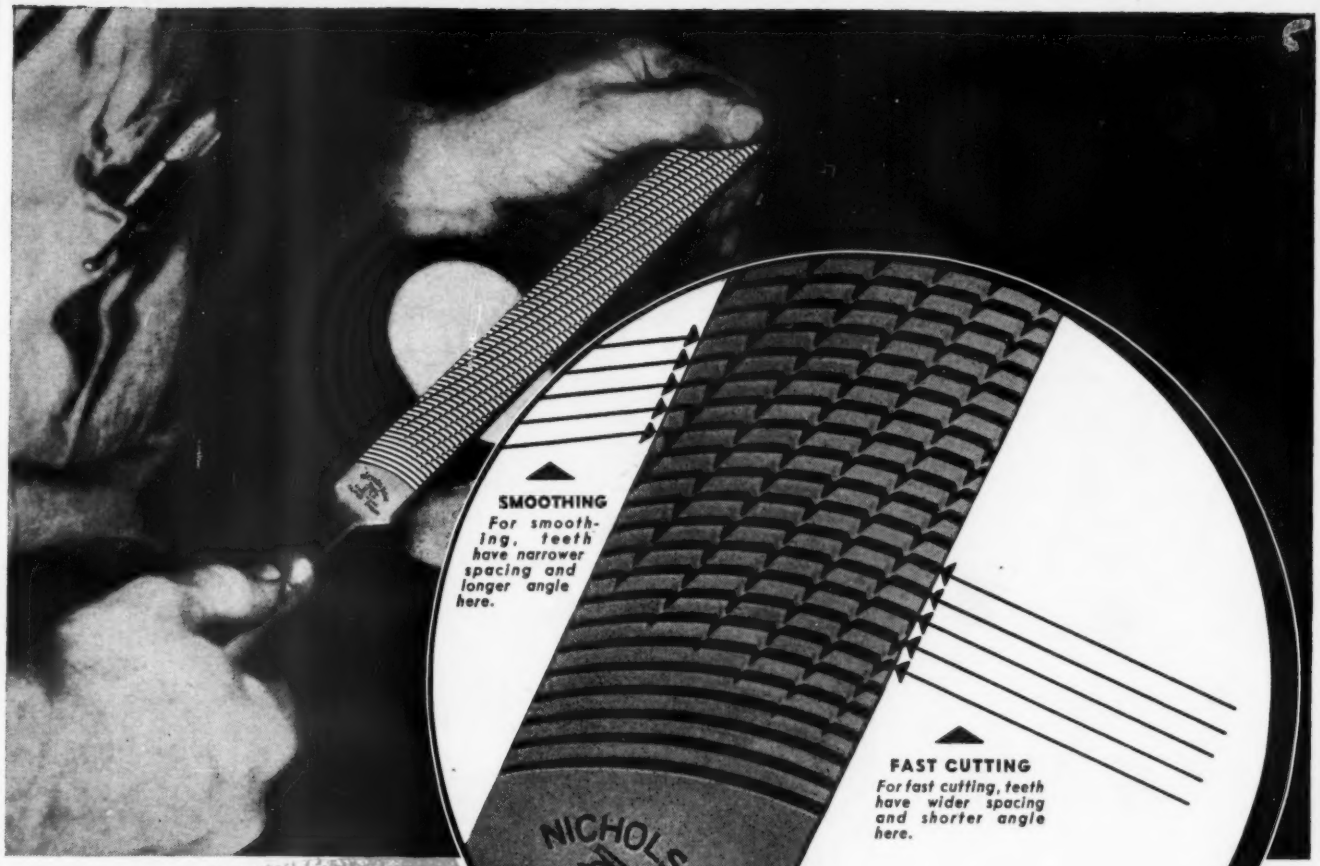

THE NEW SUPER-SHEAR FILE SMOOTHS AS IT ROUGHS

THE Nicholson Super-Shear is one of the biggest file developments in years. Basically of the curved-tooth file family, the Super-Shear is practically two files in one:

Its extremely sharp teeth are milled in an arc that is "off center" in relation to the axis of the file. This permits them to begin with deep, wide gullets and virtually a right angle — *for fast cutting.*

The teeth become shorter and closer together as they terminate in a long shearing angle — *for smoothing.*

Thus, when used with the overlapping right-toward-left stroke, the Nicholson Super-Shear "smooths out its tracks as it goes."

Longitudinal serrations, at 14°, help to break up the filings; to keep file clear of chips; to overcome "chatter" and the tendency to "run off the work."

Use the Nicholson Super-Shear wherever ordinary milled (curved) tooth files are generally used: on the flat or convex surfaces of aluminum, brass, babbitt, bronze, copper, magnesium, cast iron, annealed tool steel, plastics, hardwood, etc.

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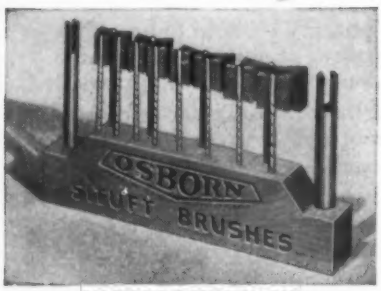

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Osborn developed the new brushing tool in the last days of the war to speed the output of military materiel. Now it can help you increase production of your product and at the same time improve it and lower its cost. *AVAILABLE NOW FROM LOCAL OSBORN DISTRIBUTORS!*

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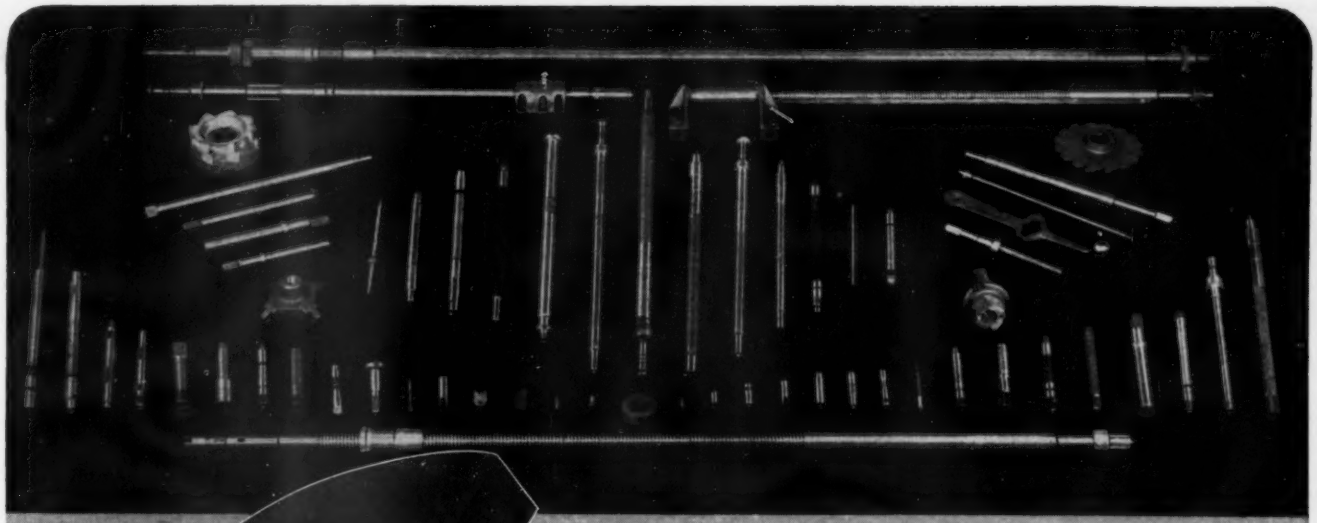

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75% SAVING

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140 different machine tool parts are Induction-hardened by Kearney & Trecker Corporation, with one standard TOCCO machine. The table limit block shown is typical. With a former process, output was 25 per hour, now 100 per hour . . . saving 75%.

The parts range in size from 1-oz. pins to 90-lb. table screws, with 11 different steels including carburized low carbon steel, medium carbon steel and alloy steel.

On a bushing, they boosted output from 500 to 3,000 per week . . . saved 50 man-hours.

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In the Moore Jig Borer you can re-check hole locations after boring, within a "tenth" and without gage blocks, while the *work is still in the machine.*

By simply inserting a dial indicator in place of the boring tool and resetting the micrometer lead screws to the original specifications, any errors in earlier settings on the workpiece become immediately apparent and can readily be corrected. Moore lead screws, accurate to .0002" over 14" of travel and to .00005" in any given inch, are *built into* the machine to assure precise inspection in rapid sequence without disturbing the set-up.

The accurate and rapid table settings that enable the Moore Jig Borer to inspect its own work simplify its operation at every stage of the jig boring procedure. You can *consecutively* spot, drill, bore or ream *all* the holes in the workpiece with minimum tool changes. No size blocks or end measures are necessary... that means less stop-and-start to change tools at individual holes.

Saving hours in your toolroom, production line *and inspection department* can make the big difference in keeping your cost sheets at competitive levels. The Moore Jig Borer is engineered to reduce these all-important hours when tolerances and profit margins are tight. We have many case examples to prove it. A letter today will bring complete details to your desk.

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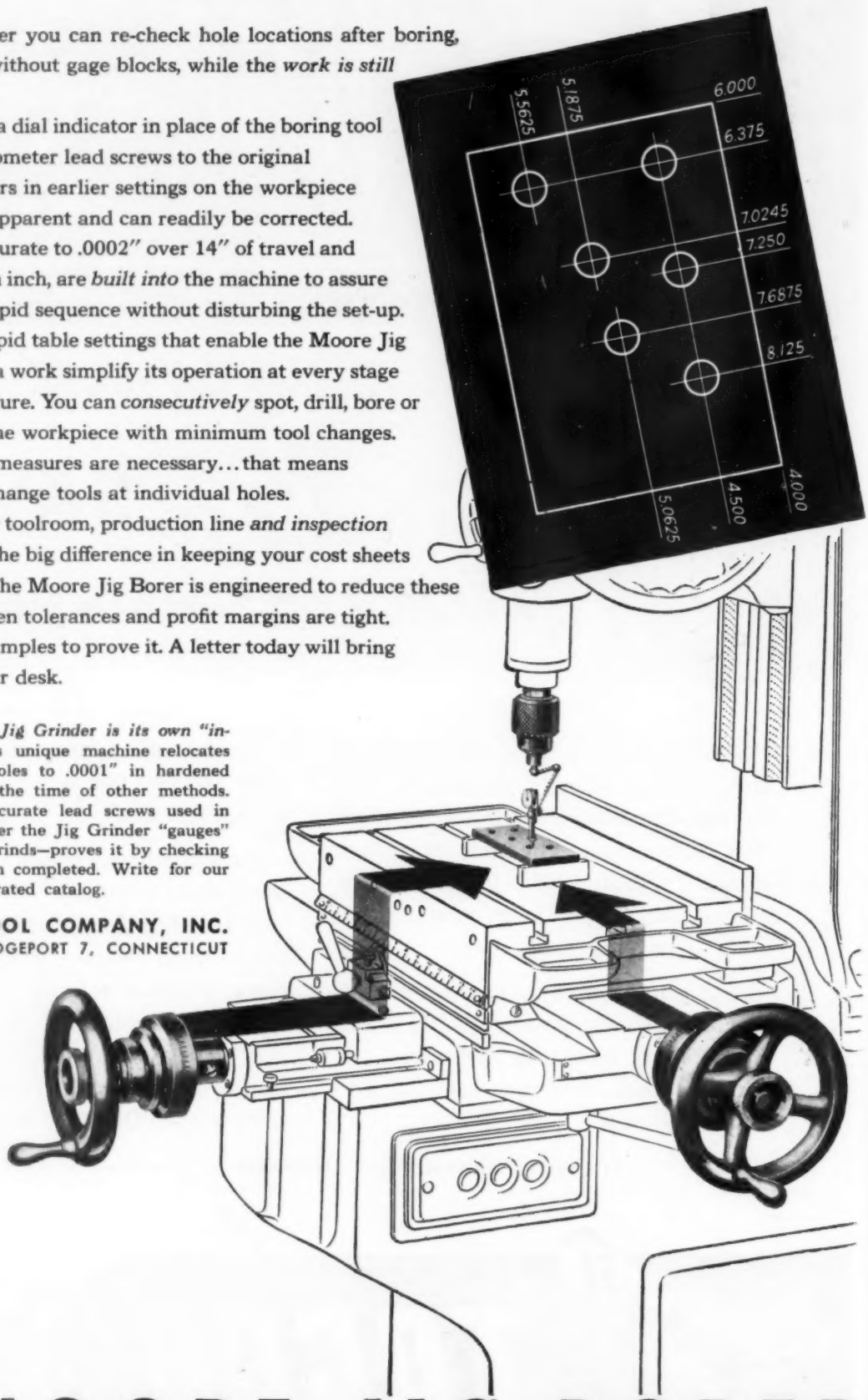

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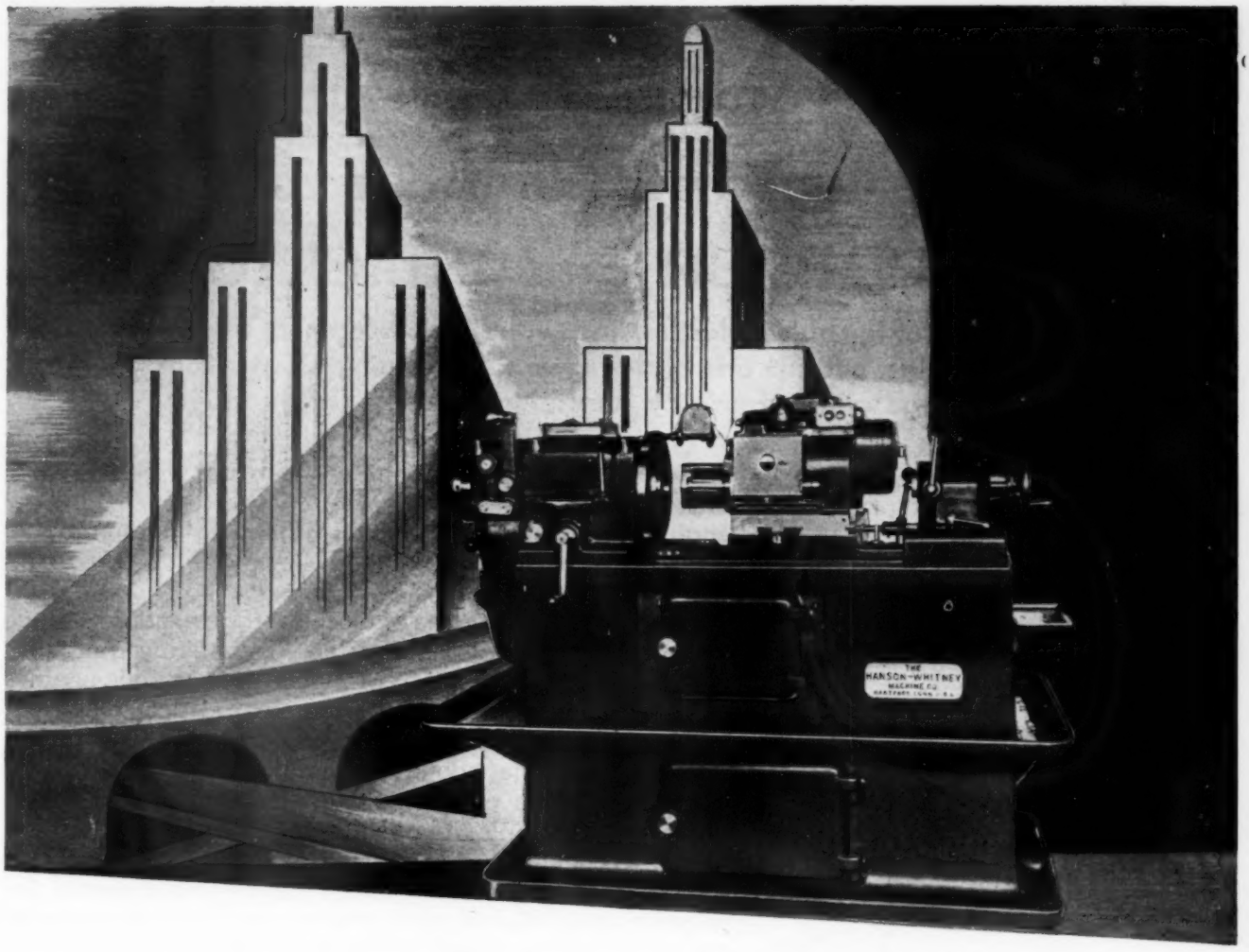
SPOTS, DRILLS, BORES, REAMS... WITH MINIMUM TOOL CHANGES



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The advantages of selecting a molder with facilities for *both* RUBBER *and* PLASTICS

Rubber, one of the oldest plastics, has, with the development of synthetic formulas, become one of the newest. Other new plastics constantly emerge and increase the choice of materials for a product.

It might pay you to select a molder with that wide range of interest in plastics, one who has the research and engineering facilities to help you find the right material.

CHEMICAL RESEARCH AND TESTING

SEMI-SCALE CONTROL AND RESEARCH PLANT

MICRO-PHOTOGRAPHY EQUIPMENT

SOMETIMES the choice of material for a part or product is easy. Other times it involves painstaking matching of the properties of a number of available materials against the specifications dictated by the chemical, optical, electrical or fabrication requirements the product may have to meet. Whether the material should be metal, plastic, hard rubber or soft rubber or a combination of two or three of them depends on the complexity of those requirements. Whatever they are, we believe we are in a good position to help you select the best and most recently developed material for your product, or, should your product require it, to develop a special rubber or plastic compound for it.

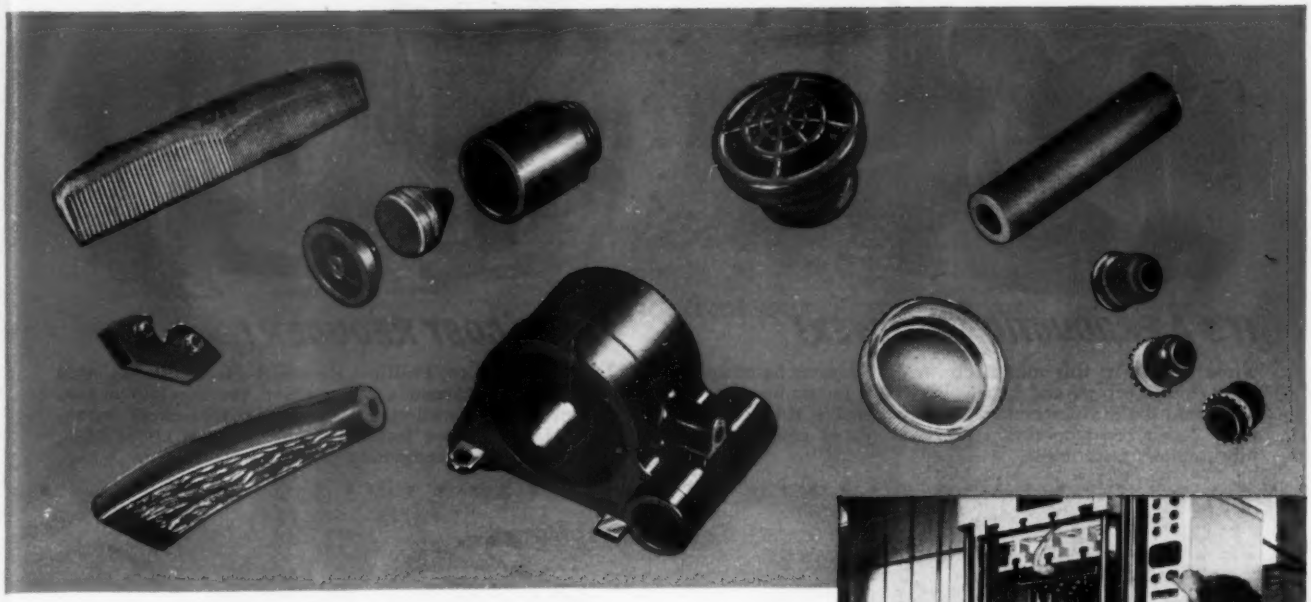
We have the completely equipped chemical and physical laboratories for all necessary research and testing. And our trained staff of engineers and technicians is backed by our sixty years of molding experience that started with hard rubber. They have helped in the development of many plastic and rubber products for various industrial and commercial fields.

Special compound for specific job

For instance, our laboratory developed a special compound when the problem of selecting the right material for an electrical connection coupler became difficult. At first a combination of metal and phenolic was tried but, under test, it was found that the coupler shorted when it was subjected to water or damp weather. Rubber was then tried but none of the compounds available at the time had the range of physical characteristics necessary to meet all field and connection conditions. Our research department then

CHEMICAL AND PHYSICAL RESEARCH AND TESTING

The above pictures show various parts of our modern, fully equipped laboratories where our trained staff tests and develops rubber and plastics materials to meet our customers' specifications. These laboratories have been largely responsible for the close tolerance work we have been able to maintain on a wide range of products.

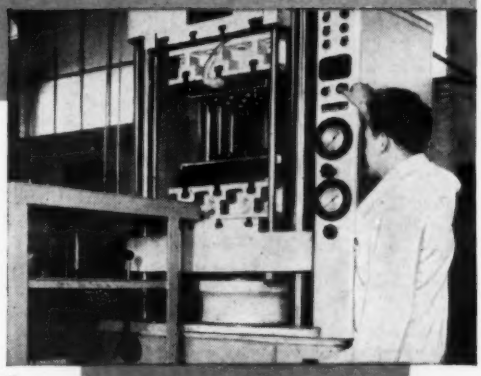


developed a special rubber compound which was able to match the specifications of high dielectric strength, very low permanent set, low power factor, etc., and at the same time had the specific compressibility to make a tight seal and the other physical characteristics for varied field service.

There are, of course, a vast number of applications where plastics are superior or where combinations are best. New and better plastics are constantly being developed, as are new compounds in synthetic and natural rubbers.

It might pay us both to get together

Not only will we be able to help you find the latest and best material, but chances are that our research assistance and facilities for efficient, large-scale production will fill your needs at reasonable cost. Just tell us where and how your part or product has to go to work, or give us the specifications. If we should find that the part or product doesn't belong, economically or physically, in any one of the wide range of plastics, hard rubber, soft rubber, or molding methods that we are set up to handle, we will frankly say so and recommend what we think is best. If you would like to have an engineer call to discuss your needs, please write Dept. A.



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Manufacturers of Rubber and Molders of Plastics

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QUALITY CONTROL AND MOLDING RESEARCH

In addition to the laboratories, quality control is maintained in a semi-scale plant. Materials are tested for behavior under operating conditions and better fabricating methods are developed. In equipment such as the 150 ton fully automatic hydraulic press shown here, the best molding method for a customer's part or product is determined.

IT'S A PRODUCTION PLUSSER!

Time was when this manufacturer of magneto housings used slotted screws *and* helical inserts to fasten heads to withstand flight vibrations. Though expensive, this laborious, 2-step hand operation never produced completely vibrationless fastenings.

IT'S A COST REDUCER!

By switching to Phillips Recessed Head Screws, this manufacturer turned a slow-motion process into a fast, 1-step power operation, got a truly vibration-proof fastening. He also sliced fastening material costs about 71%, assembly costs correspondingly!

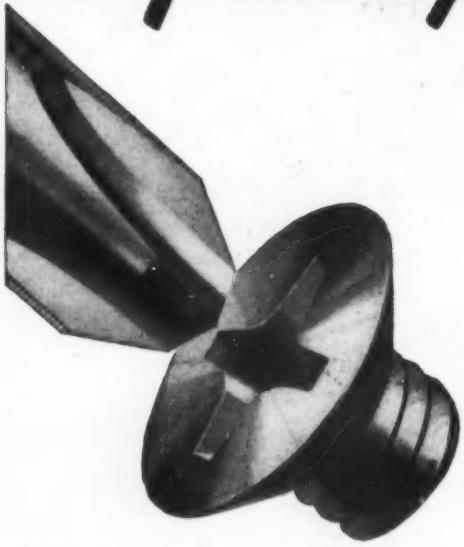
IT'S A STRENGTH BUILDER!

Besides being more efficient from assembly and cost angles, Phillips Screws are better from the design angle. Engineered to stand heaviest driving pressures, they take *any* load you need to impart product strength and rigidity.

IT'S AN ORDER GETTER!

From the sales angle, too, Phillips Screws are in a class by themselves. They snap up appearance of any product . . . make it stronger . . . and banish the burred screw heads that mar smooth surfaces, snag clothing, sabotage sales.

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

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Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
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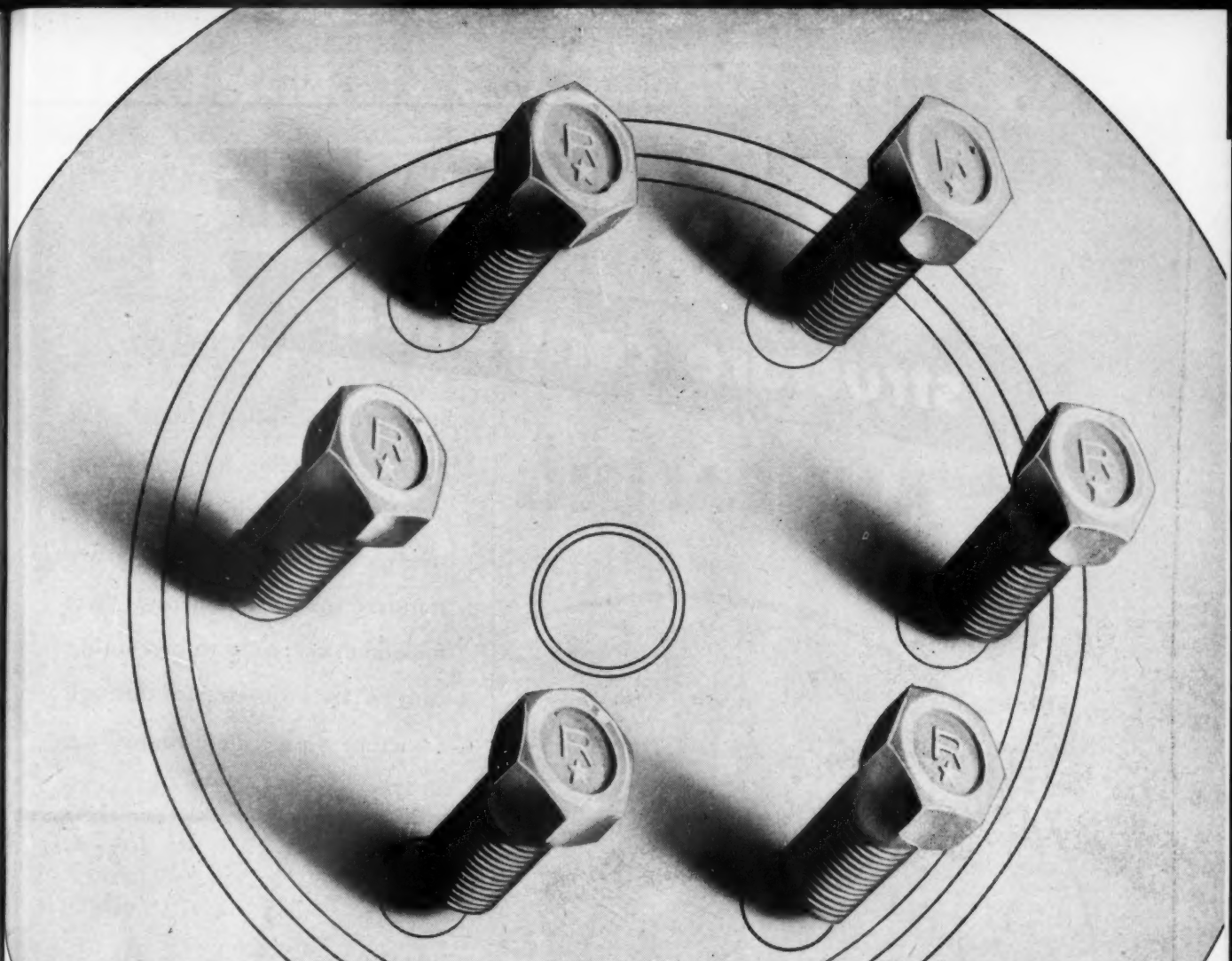

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Buffalo Bolt Company is ready for the automotive industry when it shifts into high gear—ready to supply its every need with standard or specially built circle Ⓑ fasteners as we have been doing since the beginning of the "horseless carriage" days.

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Ⓑ One of the modern Buffalo Bolt machines —capacity 4200 pieces per hour.

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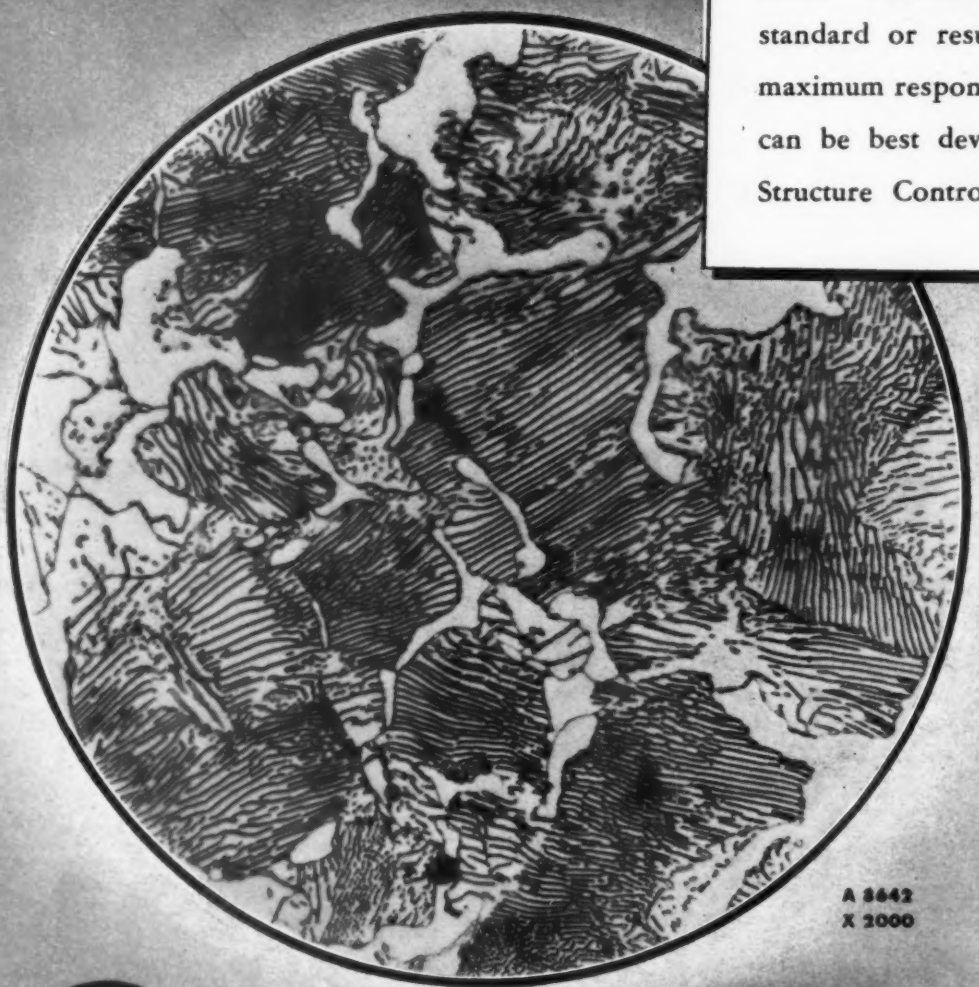
Structure Controlled Annealing is proving its value to production men of long experience with alloy steels. Whether your steels are standard or resulphurized their maximum response to machining can be best developed through Structure Controlled Annealing.



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All of these parts are made from Shelby Seamless Tubing.

1. and 4. Clutch bearing shells
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COMPETITION is going to be stiff—and every few cents you can trim from the cost of parts will put you in a better competitive position. By using Shelby Seamless Tubing instead of forgings or pieces bored from solid stock, you can make sizeable reductions in cost.

With Seamless Tubing, you start with the basic shape already made which eliminates at least one step in manufacture. The uniform high quality and proved machinability of the steel permit fast machining and parts can be turned out on a mass-production basis.

You can get Shelby Seamless Tubing in any size from ⅜ inch to 10½ O.D. inches and in wall thicknesses from .035 inches to 1.500 inch cold drawn. Our engineers and metallurgists will be glad to help you work out methods for faster production of parts at lower costs. Write for details. There is no obligation.

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Every SUNDAY EVENING
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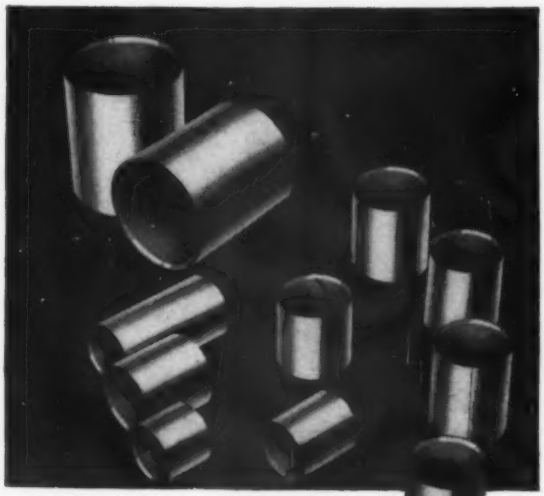
JOHNSON BRONZE
SLEEVE BEARING HEADQUARTERS

No Reconversion *problem*



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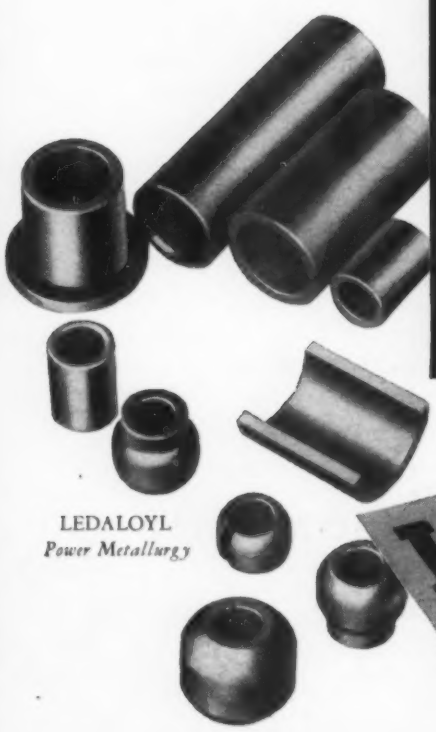

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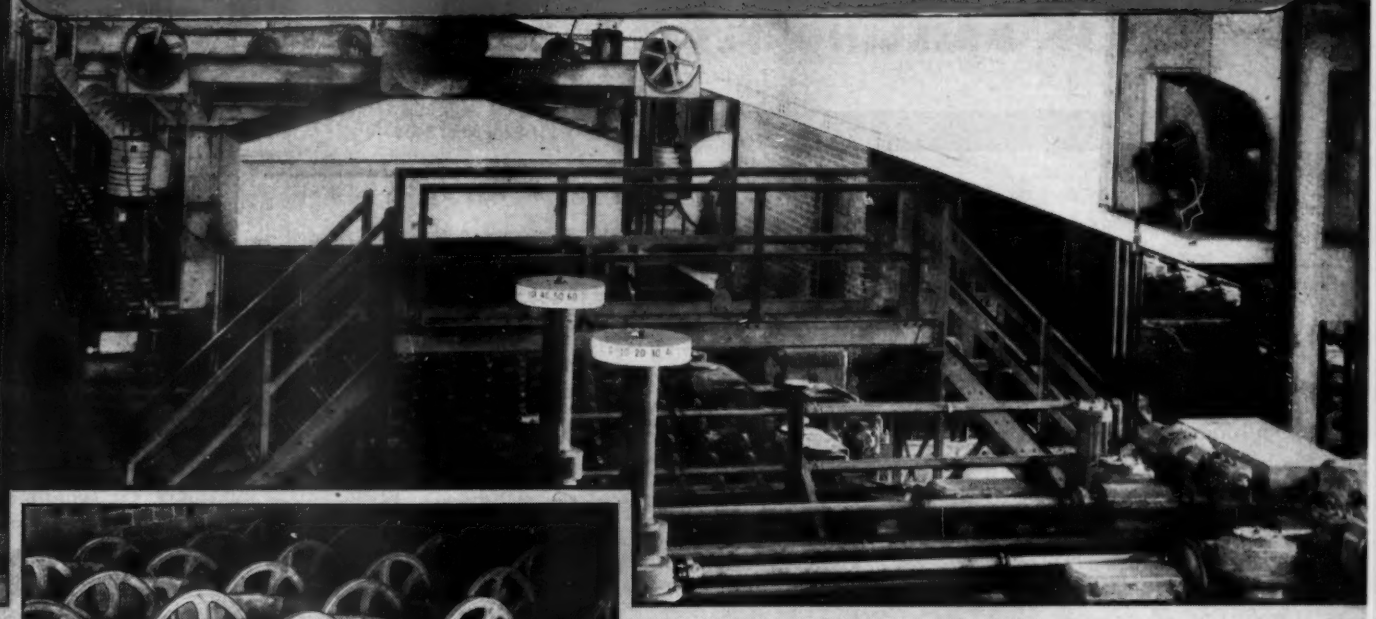
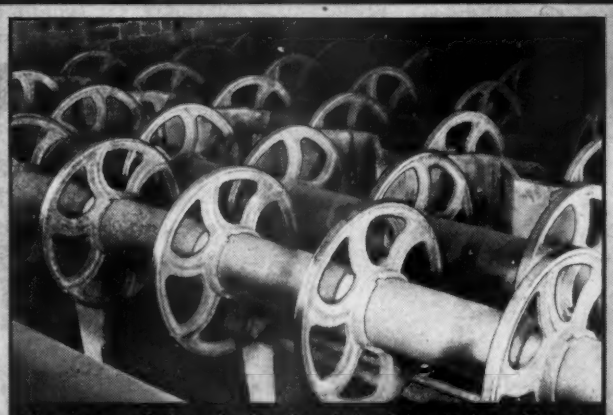
BRANCHES IN 18 INDUSTRIAL CENTERS

Castings by DRIVER-HARRIS For Heavy Loads at High Temperatures





Close-up of the shafts furnished by Driver-Harris in the conveyor of the Lukens Steel Co. furnace.

HEAT TREATING FURNACE
COMBINES MANY UNUSUAL FEATURES

An unusual feature in this heat-treating furnace installed by Surface Combustion at the Lukens Steel Company of Coatesville, Pa. is use of the inside roller-bearing dry conveyer shafts which carry loads up to 70 lbs. per sq. ft. at temperatures to 1900° F.

The furnace, which is 11 ft. wide inside, is used to heat treat heavy plates ¼" to 1½" thick. Its 123 ft. length consists of a 75 ft. *heating zone* and 48 ft. *cooling zone*. In spite of high loads and steep temperatures, the 54 inside roller-bearing shafts in the heating zone are only 5⅜" in diameter with ⅝" wall. The cooling zone has 36 water-cooled outside bearing shafts. From hot through cold zones the shaft speeds vary from 5 to 150 fpm.

Because these extremely rugged operating conditions require metal parts which combine excellent oxidation resistance with great strength at elevated temperatures *castings by Driver-Harris were specified*. And all the alloy shafts, bearings, discs, etc., were designed, cast, machined and assembled by Driver-Harris.

Unusual . . . or usual, if you have a heat-treating problem, tell us about it. Our engineers are always at your service. Write for a copy of Catalog F-40.

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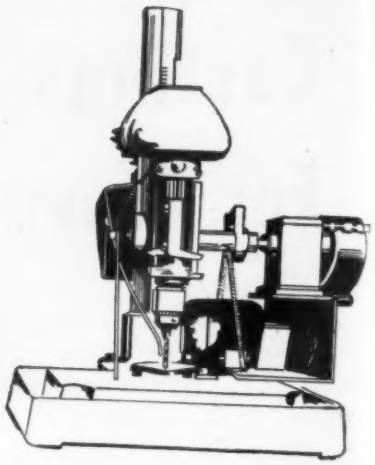
MACHINING DATA ON PLASTICS

11. DRILLING TESTS



This is the eleventh in a series of messages designed to better your knowledge of the phenolics—the most versatile of all plastics . . . the type of plastics which Durez has specialized in producing for the past quarter century

To determine the qualities of drills and drilling properties of molded phenolic materials, we must consider the following factors: 1. Type of drill, 2. Angle of the cutting edge, 3. Type of material, 4. Peripheral speed, 5. Feeding method (mechanical or manual), and 6. Cooling agent.

It is extremely important to use a testing method by which the results obtained can be repeated a number of times. Only then can we be confident that the testing method used and the results obtained are dependable and accurate.

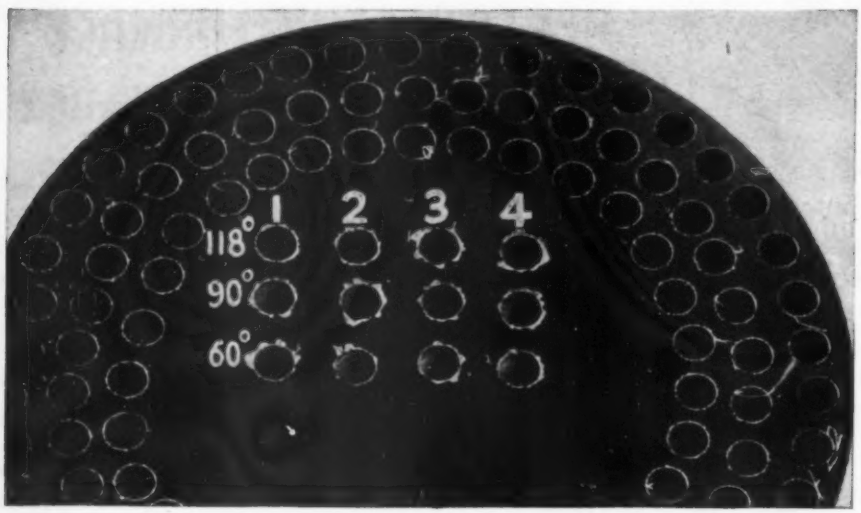
Difficulties Of Manual Operation

It is exceedingly difficult to depend on the human element in manually operating the feeding of a drill-press spindle on its reciprocating motion. Very often the results obtained will be erroneous due to the lack of uniformity in the speed and pressure of the spindle.

Mechanical Feeding

The line illustration above shows a regular standard type drill press on which a mechanical feeding device has been installed. This device consists of a motor-driven cam which causes the reciprocating motion of the spindle to operate at a constant speed and pressure. The spindle operates 9 strokes per minute at a speed of 6" per minute. There is sufficient time between strokes for the operator to change the drilling disc to a new drilling position. This also permits the operator to use both hands to manipulate the disc, which results in continuous drilling at the same rate of speed. This results in a more accurate test than would be possible if the operation was performed manually by starting at several intervals.

The life of the drill or the number of holes drilled before resharpening also depends on whether the holes that are being drilled are the through-type or blind.



Drilling Through-Type Holes

The through-type holes are most difficult to drill because of chipping possibility around the back of the hole. If

TEST TABLE	WITHOUT AIR BLAST							WITH AIR BLAST						
TEST	1			2			5	3			4			6
SPEED FT. PER MINUTE	138	138	138	75	75	75	256	138	138	138	75	75	75	256
DRILL ANGLE	118°	90°	60°	118°	90°	60°	118°	118°	90°	60°	118°	90°	60°	118°
THROUGH HOLES CHIPPED AT	52	58	83	56	59	102	3	54	60	96	68	72	202	13
BLIND HOLES DRILL READY FOR RESHARPENING	77	94	145	89	115	224	7	231	343	420	247	396	537	31

the hole is covered by a screw or a washer in the assembly, a slight chip is acceptable. However, when the hole is exposed, the chipped edge cannot be tolerated. Consequently, only 25% as many through holes can be produced as blind holes. This, of course, depends on various conditions as illustrated in the test table.

A general-purpose Durez phenolic material was selected for this test and was molded into a 4" diameter disc 5/16" thick. Regular stock 3/16" diameter steep-fluted high-speed drills (illustrated) were used. These drills were ground to the included angles of 118°, 90°, and 60°.

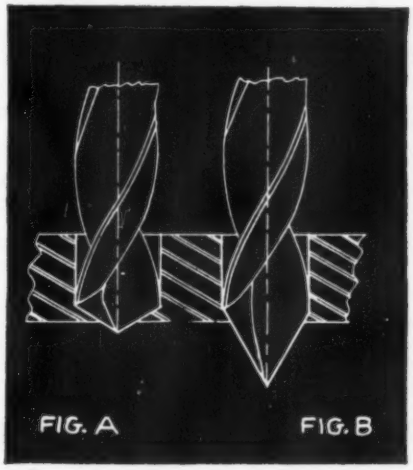
Chipping Tests

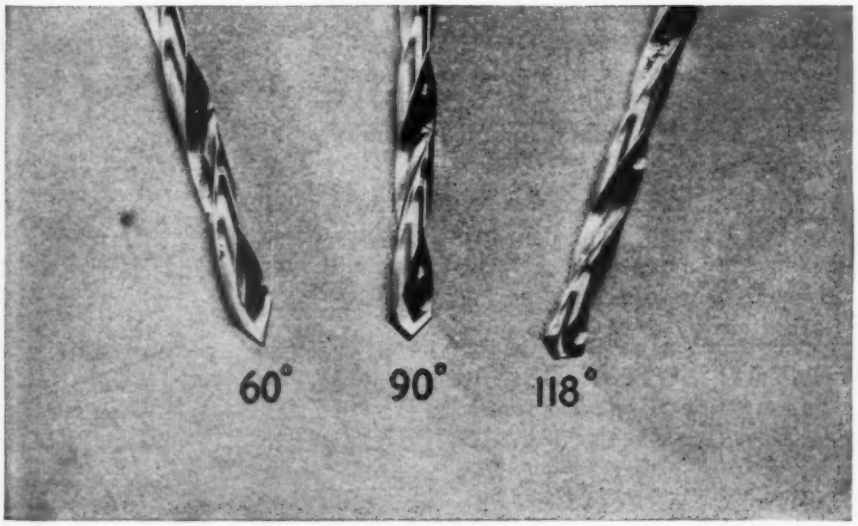
The results of the chipping tests are determined by .010" to .015" of chipping around the back of the hole at the conclusion of drilling. The number of blind holes drilled before the drill must be resharpened is determined by the dimensional wear. The holes must gage to —.001". Final check holes are illustrated in the photo of the center of test disc.

Color of the drill was also recorded. Test 1 all three drills—light yellow for approximately ½". Test 2 all three drills—light straw for approximately ½". Test 3 all three drills—light straw. Test 4—no change from original color. Test 5—burned blue. Test 6—burned blue. On test 4 the drills remained cool during the entire drilling test.

Air Blast An Advantage

A number of previous tests including mineral-filled-materials indicate that there is an increase of 200° to 300% in drilling production by the use of air blast concentrated on the drill in a position which will cause the air travel to terminate at the point of the drill.





Type of Drills Recommended

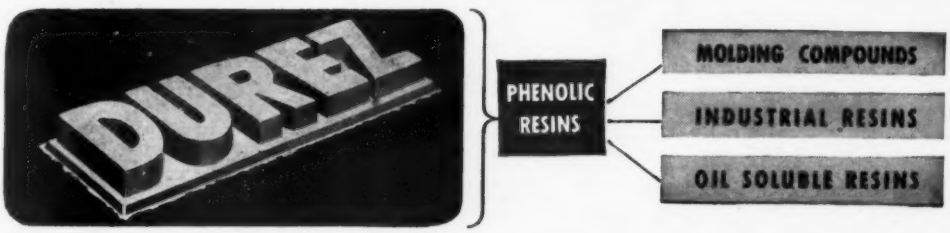
Drills ground to 60° included angle are definitely superior, especially when drilling the through-type holes. These drills increase the power requirements. However, the feeding pressure is reduced. This allows the drill to drill through with a minimum of chipping. The main factor of importance is the the remaining area of material at the conclusion of drilling a through hole. Fig. A illustrates a 118° drill and Fig. B 60°. Since Fig. A requires greater feeding pressure for drilling, and has greater area of remaining material, it will chip more readily than Fig. B.

Reducing the friction between the drill and the material by grinding the drill off center (which results in slightly larger hole) will often prolong the life of the drill. Friction causes the drill to overheat. This is particularly prevalent in phenolic materials because of their inability to dissipate heat. Consequently, all or most of the heat must be absorbed by the drill.

In some cases better results are obtained by plating the drills with hard chrome. Carbide tip drills are often used when drilling larger diameter holes and for large volume production, especially on materials which contain highly abrasive fillers.

Competent Assistance Available

The benefits of the vast experience which Durez technicians have acquired during the past quarter century are available at all times toward furthering your progress in the machining and finishing of phenolic plastics. Durez Plastics & Chemicals, Inc., 5312 Walck Road, North Tonawanda, N Y.



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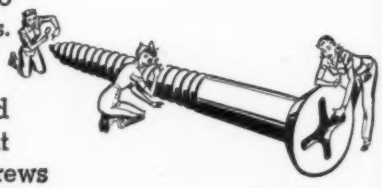

4. Automatic Weigh-Count: Each newly filled box of screws is weighed against a counted gross, to make sure that there are at least 144 perfect American Screws in every gross-box.

American's modern, high-speed manufacturing methods . . . checked by these four inspections . . . are easy-to-see reasons why more and more screw and bolt buyers are marking their orders: "American brand . . . don't substitute."

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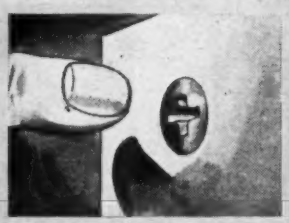

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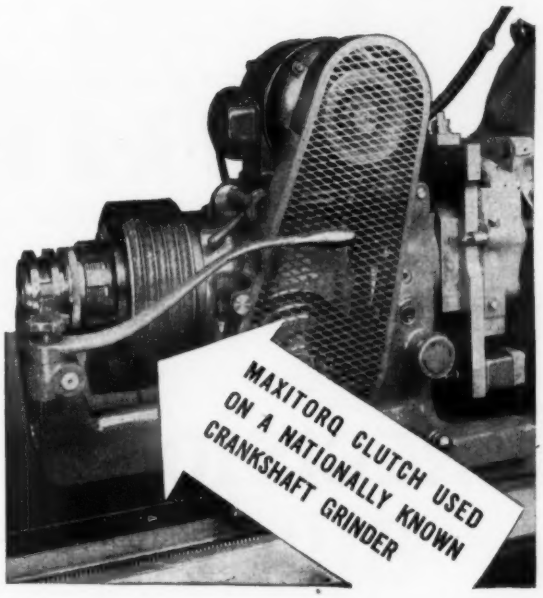
This is a worthwhile clutch specification for your new applications . . . especially since Maxitorqs cost no more, often less, than less satisfactory units.



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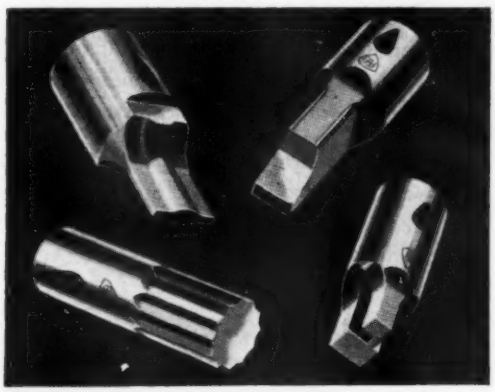

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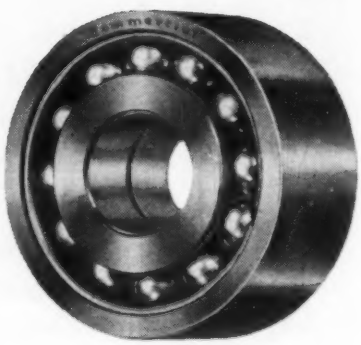

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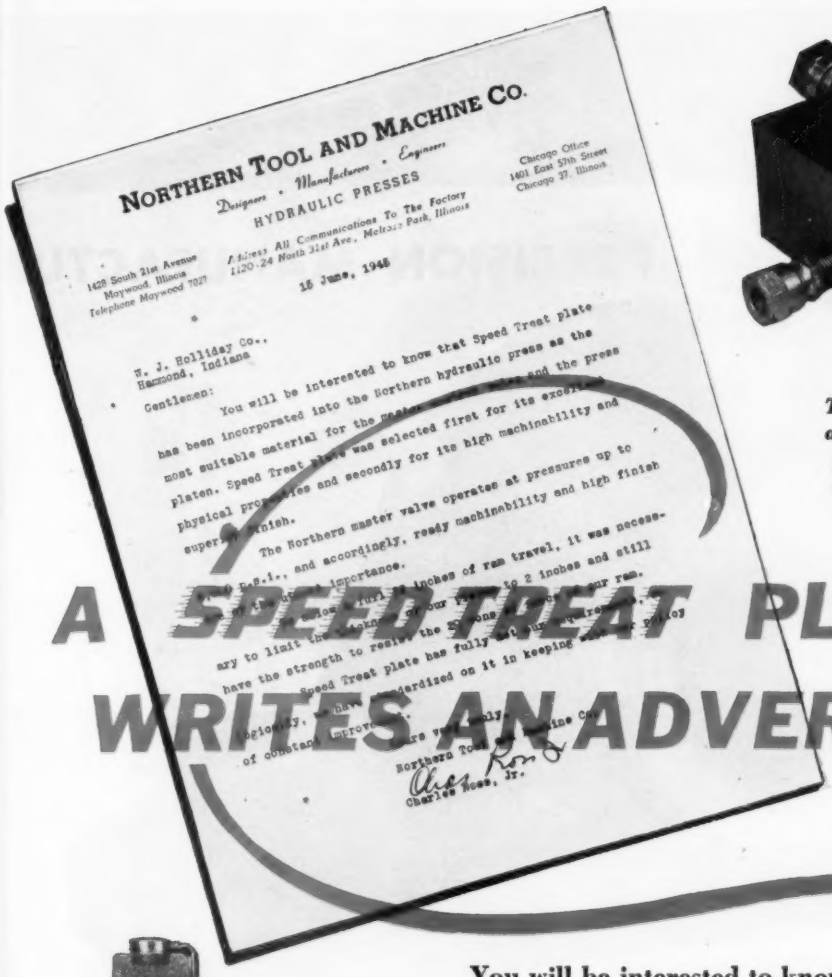
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16 June, 1945

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You will be interested to know that Speed Treat plate has been incorporated into the Northern hydraulic press as the most suitable material for the master control valve and the press platen. Speed Treat plate was selected first for its excellent physical properties and secondly for its high machinability and superior finish.

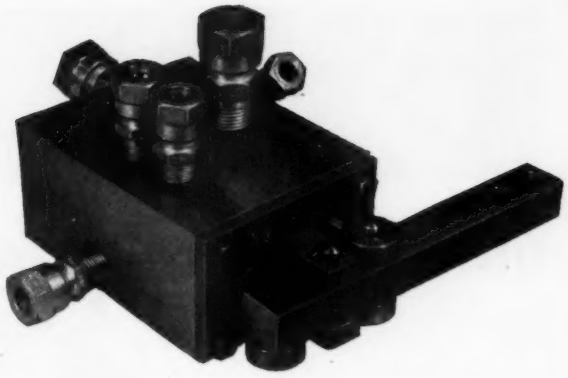
The Northern master valve operates at pressures up to 4,500 p.s.i., and accordingly, ready machinability and high finish are of the utmost importance.

To allow a final 12 inches of ram travel, it was necessary to limit the thickness of our platen to 2 inches, and still have the strength to resist the 20 tons of force of our ram.

Speed Treat plate has fully met our requirements, so logically we have standardized on it in keeping with our policy of constant improvement.

Northern Tool and Machine Co.

Charles Ross, Jr.



The Northern Master control valve operates at pressures up to 4,500 p.s.i. *Speed Treat plate provides the necessary ready machinability and superior finish!*

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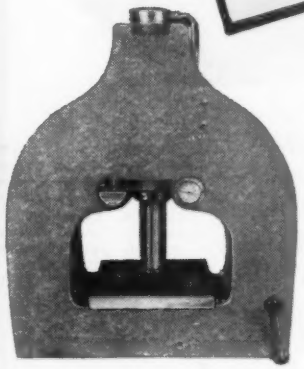

The Northern Platen must sustain a pressure of 20 tons *—Speed Treat plate provides the requisite physical properties!*

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***Speed Treat* plate is stocked in all standard sizes at twelve strategic, nation-wide points and is available flame cut to size.**

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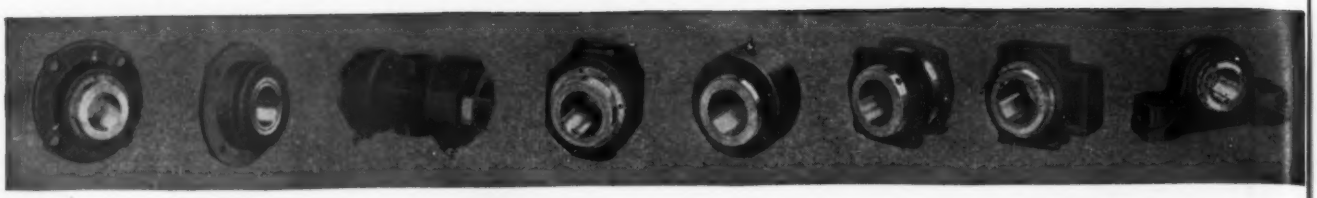

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Link-Belt Series "DE" roller bearings, illustrated, are self-contained and are properly adjusted at the factory, requiring no further adjustment at installation. Their inherent self-aligning and pre-adjustment features make it unnecessary to resort to the use of undesirable, expensive, or cumbersome self-aligning housings. The "self-contained" feature also permits the bearing to be floated axially in the housing to compensate for shaft expansion.

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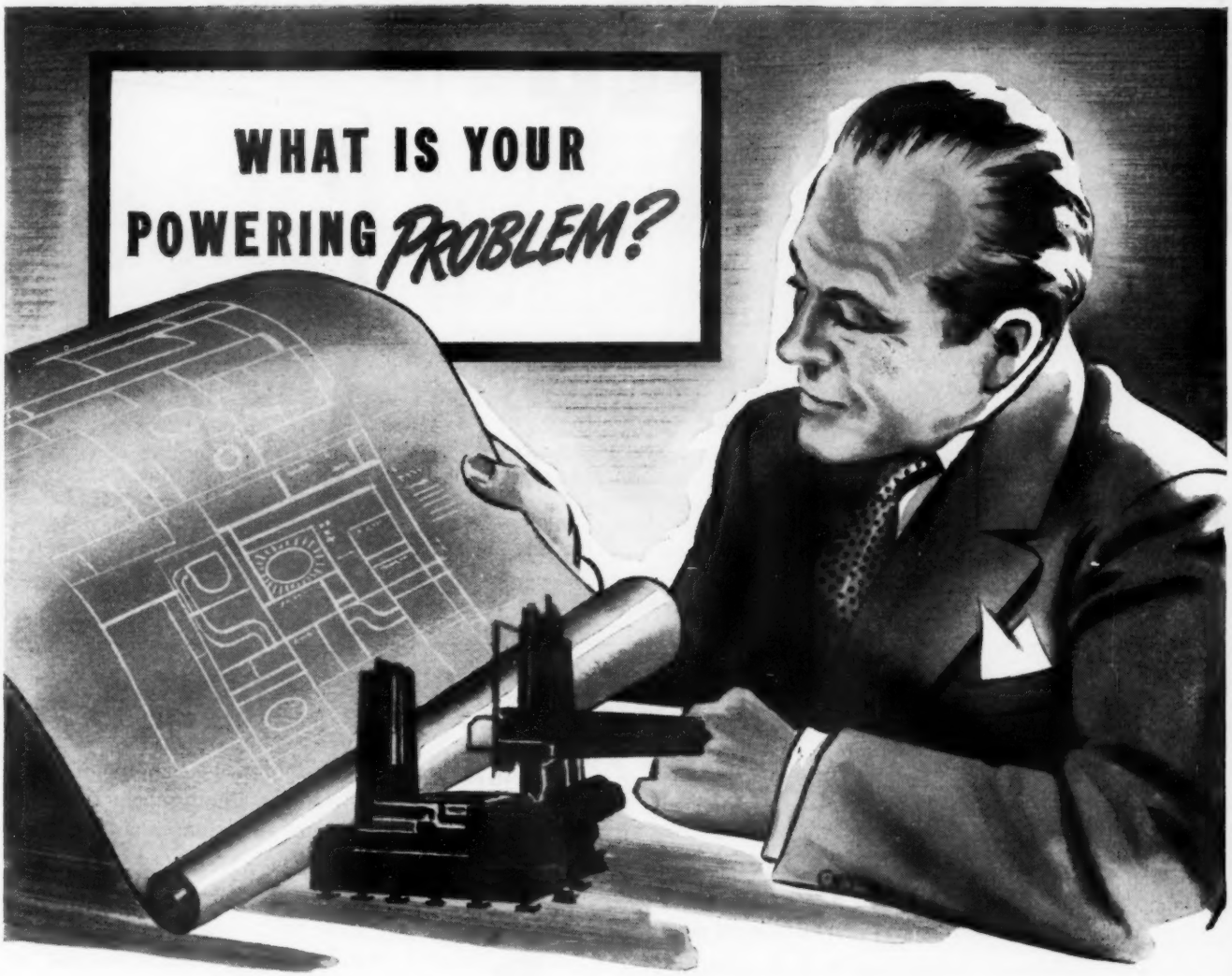

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- Service-free performance
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For submerging in coolant reservoir.

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For submerging in tank, or mounting integrally with cover.

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Making Wedge Wire Screens of Stainless Steel

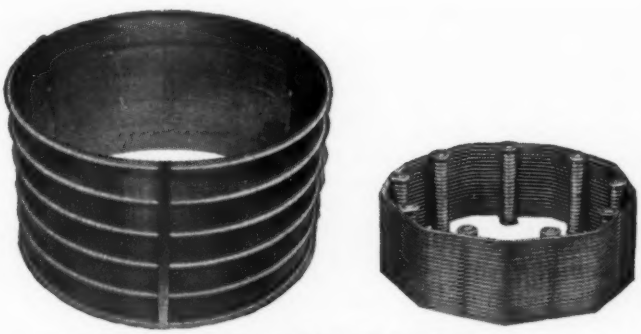
Fabrication of Special Screens for Industrial Purposes Requires Stainless that is Uniform and Will Stand Severe Deformation - both Hot and Cold

Given a stainless steel which is completely uniform—the kind that the Rustless Iron and Steel Corporation makes — and an adequate amount of sales engineering, a comparatively small company can fabricate "difficult" products of stainless steel with less trouble than is encountered with most other materials. This is the experience of Wedge Wire Corporation of Cleveland, Ohio, makers of special screens for coal washing and for foods and chemicals.

Machinery for making Wedge Wire screening was brought to this country from England only a few years ago. The unique product made with this equipment is attracting wide interest because of several advantages over ordinary wire mesh claimed for certain applications. The screen-wire itself is formed into wedge or other shapes (see next page) to produce controlled openings through which the liquid and fines being screened can pass. The fact that the surface is almost flat is one reason why Wedge Wire is less apt to clog and thus gives greater production than ordinary screen. The flared contour of the escape passage is also said to produce a desirable orifice and minimize clogging. Furthermore, of fine screening, Wedge Wire screens are more rigid than ordinary fine mesh.

Wedge Wire screens must be made to close tolerances. To achieve a high degree of control of screening the wire-to-wire openings must be held to plus or minus .002", which means holding the top widths of the wires themselves to plus or minus .001".

The assembly of the screen calls for forming loops at evenly spaced intervals in its wire members and passing tie-rods through the loops of several consecutive wires to form a screen which is rigid and in exact alignment. The loops must mate where the wires cross the tie-rods, to form tight and clog-proof joints. And the inside diameters of the loops must have a close but not binding fit on the tie-rods to form an assembly which is free from play between members but also is free from strain. All of this calls for stainless steels which will deform to exact tolerances under the dies which form the wire and loop shapes, and which will not spring back or creep appreciably after being deformed.

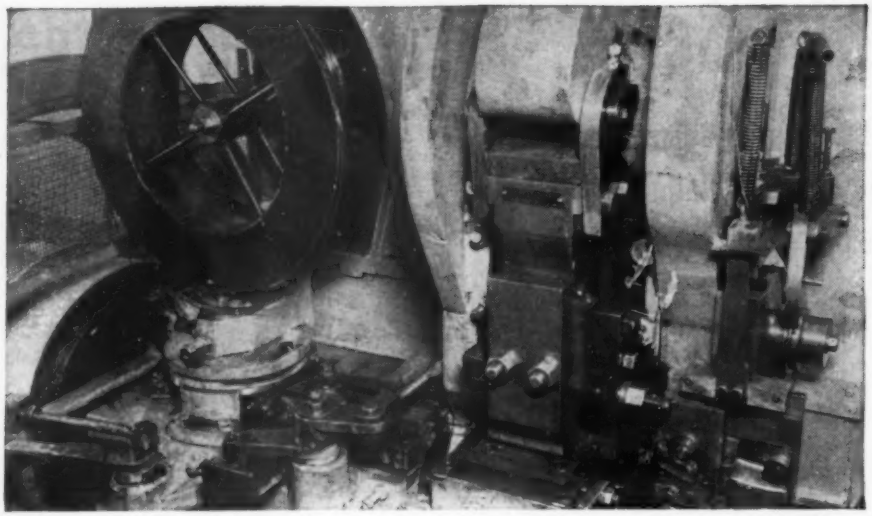


Two Types of Stainless Steel Wedge Wire Circular Screens.

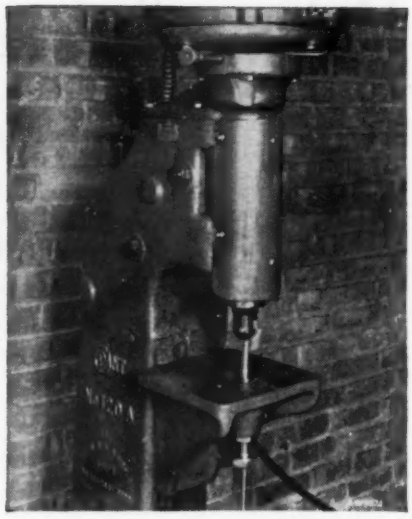
In service the screens are for dewatering, filtering, washing, drying and the separation of materials. A few of the numerous places where they may be placed are in chutes, hoppers, shakers, sluices, drag conveyors and baskets in stationary or moving frames. They are also formed into circular sections for suction filters, centrifugal and rotary screens. While retaining their true form and stiffness under such service, the screens must handle products which may be erosive, corrosive, or both. Wedge Wire screens find wide use in coal, processing plants, chemical plants, food plants, soy-bean and other oil plants, limestone plants and the like. It is because of superior structural and fatigue strength as well as resistance to both erosion and corrosion that stainless steel is used. Stainless steel not only is longer-lived in service, but with its superior mechanical properties increases the kind and amount of stress to which the screens can be subjected and thereby widens their fields of usefulness.

Rustless 17 and 18-12-3Mo, stainless steel Types 430 and 316, are used; Type 430 is preferred for coal plants and Type 316 for chemical and food plants. The material is bought with a thin uniform electrodeposited copper coating, the copper acting as a die lubricant when forming the wires and loops. Generally the copper is not removed since it in no way affects either the performance or the durability of the screen. If it is necessary to remove the copper, this is easily done by dipping in a 10% solution of Nitric Acid. This dissolves the copper but does not affect the stainless.

Production operations include straightening the round wire which has been received in coils; cold forming the loops and cold pressing into the wedge cross section or other shaped members, cold heading one end of each tie-rod, passing the tie-rods through the loops for preliminary assembly, squeezing the wires together along the tie-rods to get the final tight and rigid assembly,



The working Area of the Forming Machine.



Cold heading on a Conventional Type Riveter.

cutting off the tie-rods to length, and hot heading the open end of the tie-rods to hold the wires in place.

Stainless steel shows definite advantages at the first or straightening operation. Straightening is done in a conventional double bending machine, with the wire being wound on special reels to fit the forming machine after the wire has been straightened. One of the purposes of straightening is to take the kinks out of the wire which resulted from possible rough handling in shipment. Once out of stainless these bends do not return as they sometimes do in other metals of which these screens can be made. That is, the proper kind and temper of stainless steel is more readily straightened, and does not spring back. This reduces fabricating costs, since bends in the wire result in stoppages at the forming machine and sometimes in broken dies.

The forming machine loops the wire, forms its cross sections to true and accurate contours, and cuts it to the length needed for the screen, all by fully automatic operations.

The first operation in this machine is forming the loop by winding the wire once around a die pin. Here the complete uniformity of Rustless stainless steel first shows its value. If all of the shipments of wire passing through this process were not alike in both size and temper, then some loops would bind too tightly on the pin so the pin could not be withdrawn to clear them, some would wind too loosely and result in oversize loops which would need special diameter tie-rods for assembly, and some might spring back after winding so that subsequent forming operations would be impossible. With Rustless stainless steel there never is any trouble.

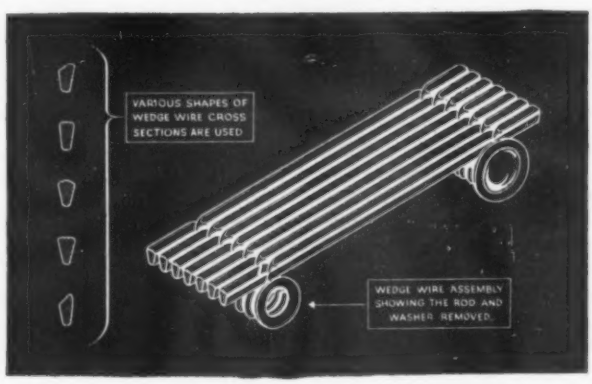
The round wire with loops in place passes to the forming dies. This forming operation is severe. It must produce flat surfaces, concave ones, or convex ones which possess two entirely different radii than those of the original wire, hold one or more dimensions to plus or minus .001", and deform the wire through about one-third of its original cross-sectional area. The loops also must receive new cross-sectional forms, and these are different from those of the straight sections of the wire. The fact that all this can be done on machines which have only ordinary press actions and which use dies made of ordinary die steels, should relieve many a metal fabricator of the idea the stainless steels are necessarily difficult to work.

Severe forming operations like these cause the metal to flow lengthwise as well as crosswise of the wire. This lengthens the distances between the already spaced and formed loops. Here the complete uniformity of Rustless stainless steel wire provides a second advantage.

Any lack of uniformity in the wire will change the distances which these loops move apart under the forming. Resetting of the machine motions can compensate for some variations in the loop spacings, but any such variations result in increased or decreased over-all lengths of the finished wires since the automatic cut-off mechanism is actuated by a counting mechanism which trips the cut-off after a preset number of strokes of the forming ram and not by anything which takes lineal measurements. The finished wires must come to correct lengths or (if not too bad) be cut to length or else be rejected. Any corrective operations whatever mean loss of machine time and of labor time as well as scrapping materials upon which expensive operations have been performed. With uniform Rustless Stainless Steels these troubles are not encountered.

Completely uniform materials also are important at the cut-off. A steel that is too hard will snap off under the cut-off tool, this tendency being enhanced by the amount of work hardening which the material can receive under the previous severe forming. A material too soft can mush or deform here. Either condition requires a corrective operation if the finished wire is to be salvaged. Completely uniform and correct material avoids this added expense.

Finished Wedge wires run automatically into a gutter of a flat,



metal-topped table. They are transferred to the table top, their loops are aligned, and just enough steel assembly guide pins to hold the wires in alignment are run through a few rows of the loops. Then the wires are transferred to the assembly department.

Primary operation of assembly is to cut stainless steel tie-rods into lengths a few inches longer than the intended widths of the finished screens. This is done in an ordinary power hack saw.

One end of each piece is cold upset to form a head against which the wire loops can bear. This upsetting is done with an ordinary air hammer or in a conventional-type rivet-spinning machine. This company never has had any trouble with upsetting operations on Rustless Stainless Steels.

The Wedge Wire loops are held to close but not extremely fine tolerances. Originally they were held to plus or minus .0015″; an over-all tolerance of .003″. But when experience proved that the inside diameters of the loops were more likely to come undersize than oversize, due to wear reducing size of the winding pin, the tie-rod dimensions were changed to plus .000″ minus .003″, thus bringing all of the tolerance to the minus side.

The fit of the loops on the tie-rods ranges from snug to light press categories, but never a force fit or a drive fit since the loops are desired to be supported but not strained and not to be given any tendency to cock or to deform during the assembly operations. The rods, then, are inserted by hand, the assembly guide pins which had been inserted at the forming machine being withdrawn.

The loose assembly is moved over so the cold-headed rod ends bear against a raised edge of the assembly table. This raised edge is to serve as one jaw of a clamp. The opposite jaw is placed against the free side of the assembly and is tightened toward the raised edge of the table. Tightening the loops together leaves an excess end of tie-rod protruding from the side. This is cut off, an adaptation of a conventional portable pneumatic shear being used for the purpose. Complete uniformity of the rod stock is important to this operation to avoid deformation of the rod ends.

Enough of the excess end is left for final hot upsetting. A stainless-steel washer is placed on this end; the end is quickly raised to red heat with an acetylene flame, and the final hot upsetting is done with a portable compressed-air hammer of conventional type. Rapid air cooling is not detrimental to Types 430 or 316 for Wedge Wire applications.

A variation of this assembly procedure is used when the screen is to be curved to be used in a centrifugal or other machine. The "top" surface of the screen can be arranged for the screened material to pass either from the outside to the inside or from the inside to the outside of the screen cylinder. In either case, it is the tie-rods and not the screen wires which must be bent. The bending is done before assembly, the rod-end usually being threaded so that nuts can hold the meeting edges of the screen to a joining member (usually a channel iron) which completes the wall of the cylinder.

A still later variation is to make the screen flat and then curve the rods in a bending brake. Mechanical techniques for this are being developed by a user of the screens but are being kept unpublicized. By such methods the finished screens can be treated as semi-finished raw materials to be formed into many special shapes for better adaptation to special purposes.

The Wedge Wire Corporation and its customers, then, are able to severely deform and re-deform stainless steels with no special or extra careful handling, no heat-treatments of any kind, no metal cleaning or other "after processes" to prevent corrosion, and almost no manufacturing rejects. They are doing no more than handle it in the offhand manner that would be accorded to "ordinary" metals. They are handling it in a trouble-free way that is made possible first by the excellent fabrication and mechanical properties of stainless steel in general, and second by the complete uniformities of Rustless Stainless Steels. And of all the factors which permit this simplicity of methods, uniformity is by far the most important.

The End.

Rustless engineers are glad to work closely wtih those who fabricate stainless steels into industrial equipment or consumer goods. Their cooperation has been invaluable to many firms, which is natural enough since Rustless has never done anything in its entire history except produce, study, learn about stainless, how to machine, forge, heat treat, electropolish, blacken, otherwise work with stainless easily and economically. Much of the Rustless knowledge has been put into printed form. Write for helpful new chart entitled "Trade Names of Stainless Steels."

Final hot upsetting of Rod Ends.

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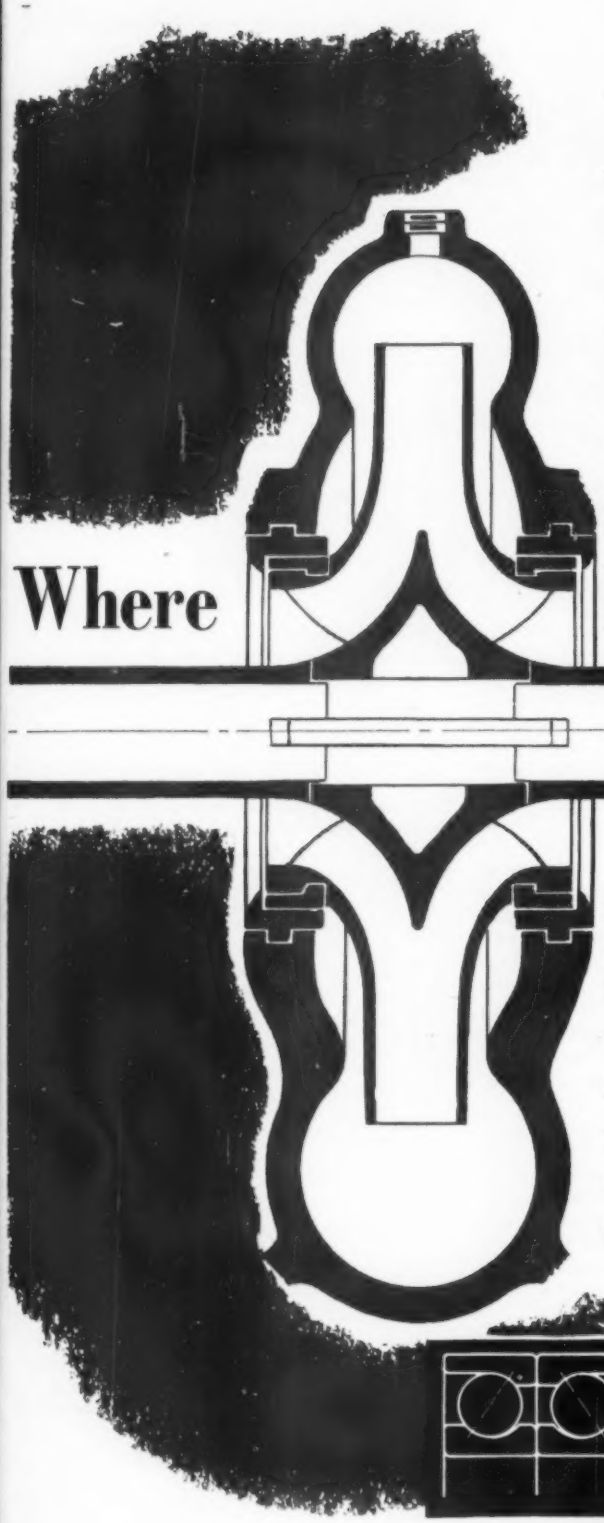

A TIGHT-SPOT with a drive shaft . . . that's a centrifugal pump. It's necessary to fit the rotating element that does the pumping so closely inside the housing that clearances are extremely minute. That's how you get suction and it's also how you can get into trouble if there's end-play in the drive shaft. Only ball bearings can take that combination of heavy radial and thrust load and high speed and hold vital clearances.

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It's the way Fafnir enters into working partnership with machine designers and machine users in offering practical solutions to any bearing problem that makes so many executives say, "Let's put it up to Fafnir." The Fafnir Bearing Company, New Britain, Connecticut.

FAFNIR BALL BEARINGS

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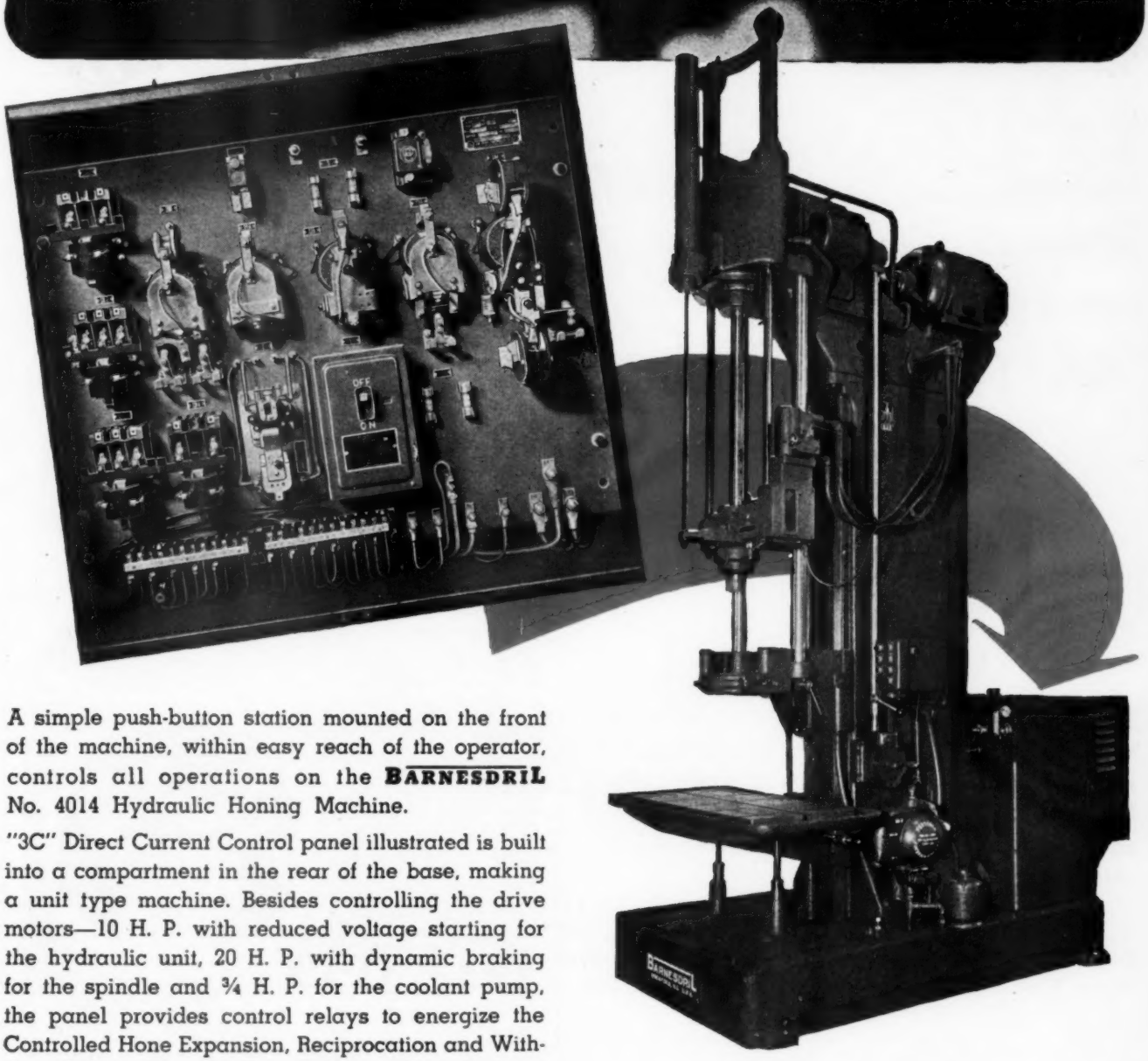
"3C" CONTROL SIMPLIFIES INTRICATE OPERATIONS ON BARNESDRIL HONING MACHINE



A simple push-button station mounted on the front of the machine, within easy reach of the operator, controls all operations on the **BARNESDRIL** No. 4014 Hydraulic Honing Machine.

"3C" Direct Current Control panel illustrated is built into a compartment in the rear of the base, making a unit type machine. Besides controlling the drive motors—10 H. P. with reduced voltage starting for the hydraulic unit, 20 H. P. with dynamic braking for the spindle and ¾ H. P. for the coolant pump, the panel provides control relays to energize the Controlled Hone Expansion, Reciprocation and Withdraw Solenoids, and a Time Relay to allow the hone to cut free after maximum expansion before it energizes the solenoid for withdrawing the hone from the work.

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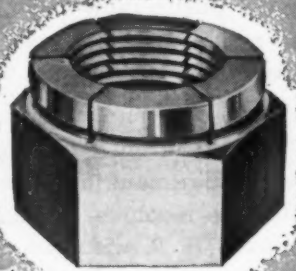

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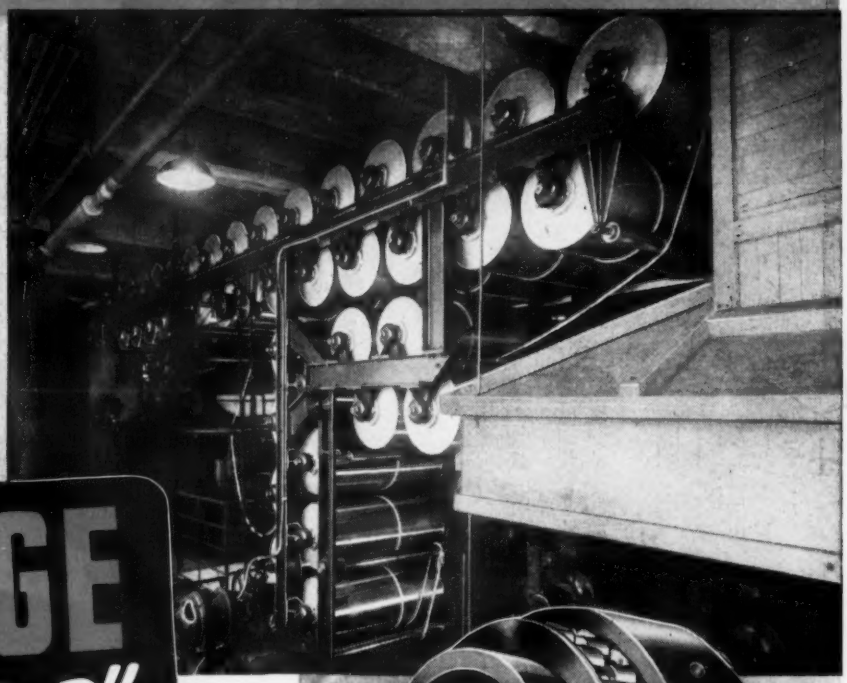
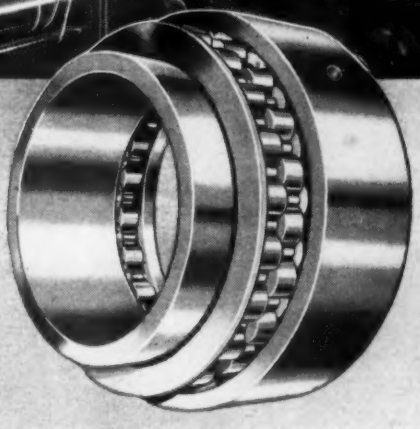
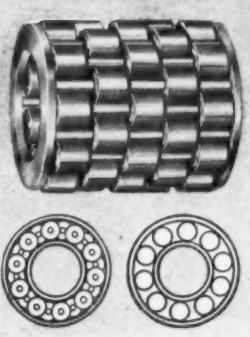


ORANGE "STAGGERED" ROLLER BEARINGS



WHILE Orange Staggered Roller Bearings are performing an unusual job in the above application, they are most widely used for their great load carrying capacity in heavy operations and their extremely smooth running in precision operations.

The unique staggered design distributes the load over many short rolls instead of a few full length rolls. As a result, Orange Staggered Roller Bearings do the work of larger size conventional bearings and stand up longer under severe running conditions. Skewing of rollers is minimized due to ease of alignment and adjustment in the raceway load area. Even running and trouble-free operation are assured. Made in a full range of standard *interchangeable* sizes. Special sizes made to order. Engineering Data Book sent upon request.



Shown are end views of an Orange Staggered Roller Bearing and a conventional roller bearing. Note how staggered roller design provides a multiplicity of contact points within the loaded zone.

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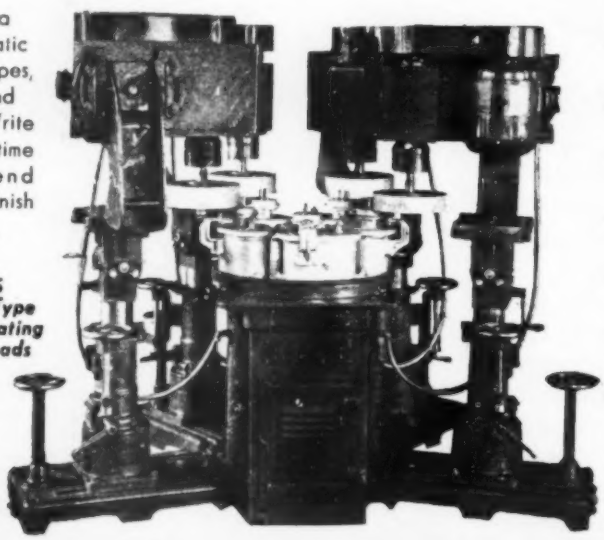

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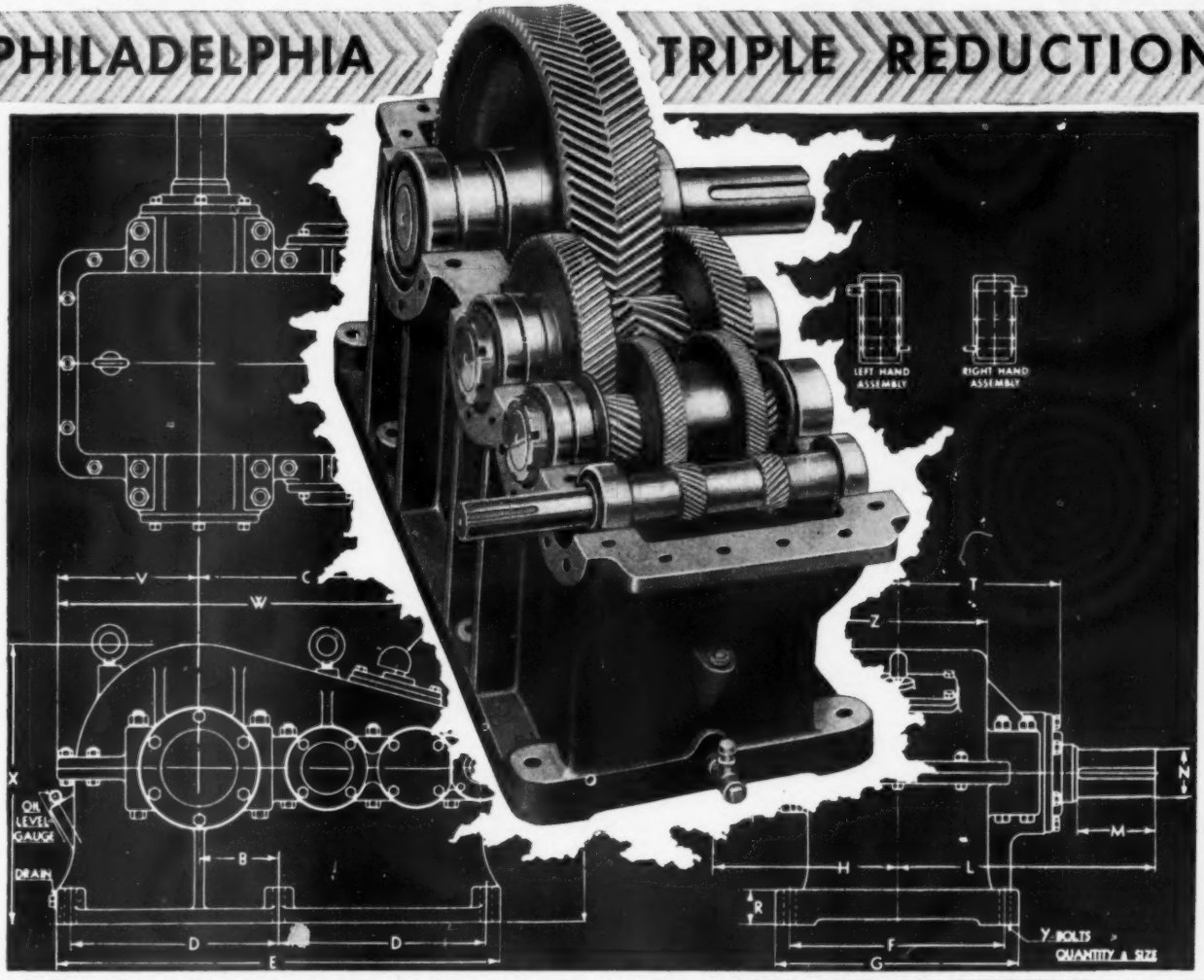

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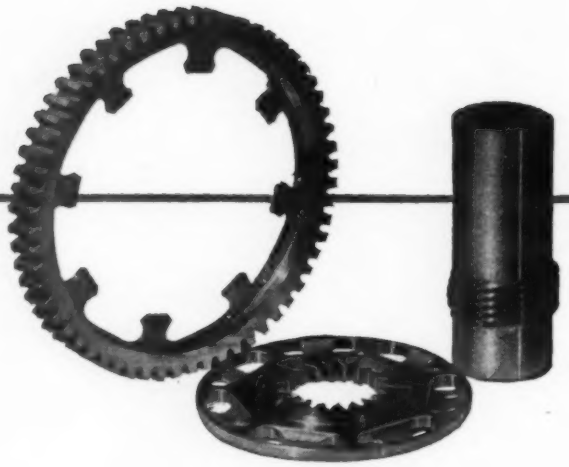

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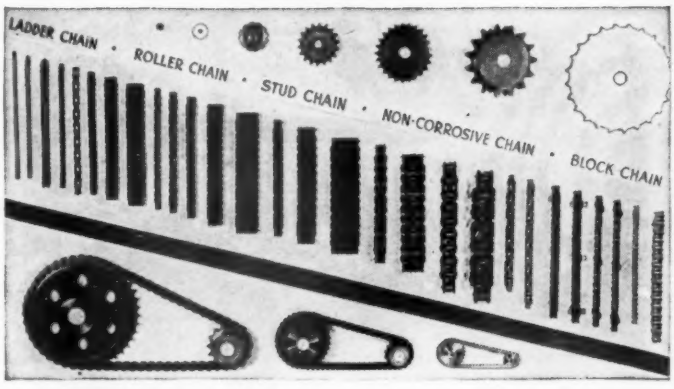

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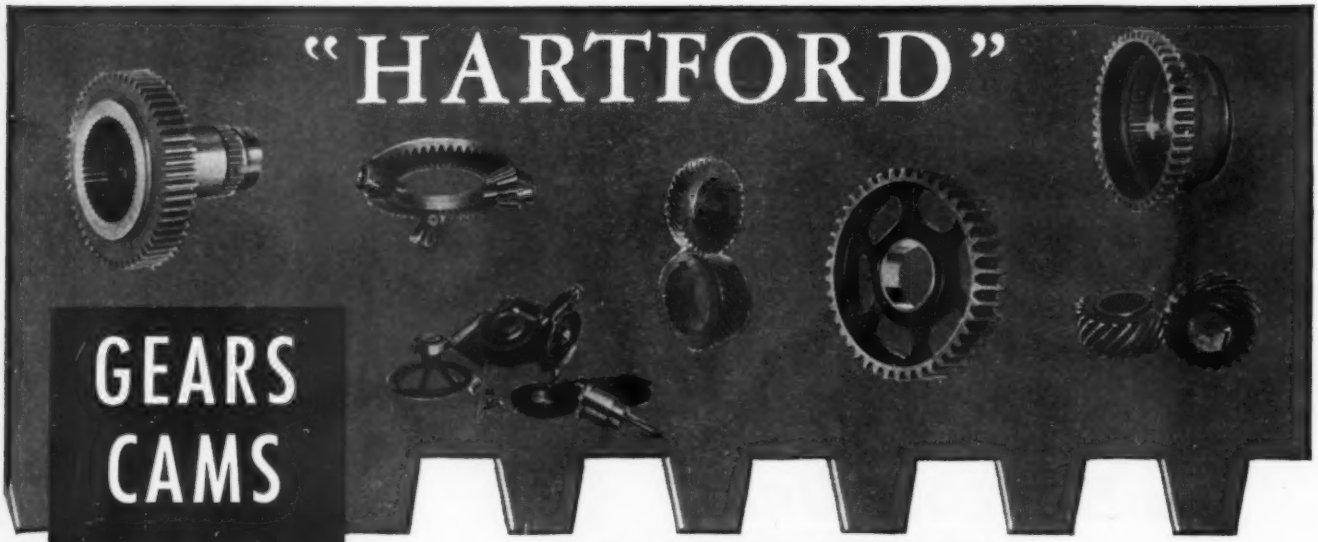

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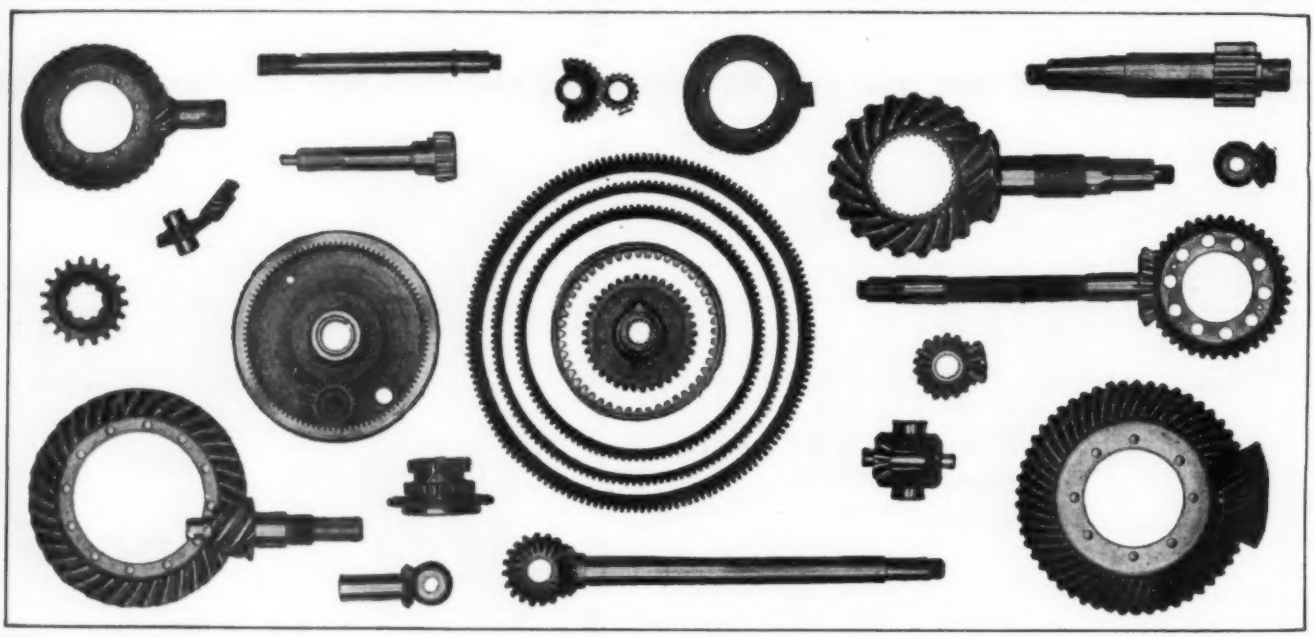

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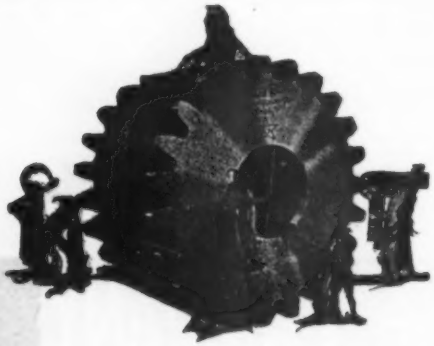

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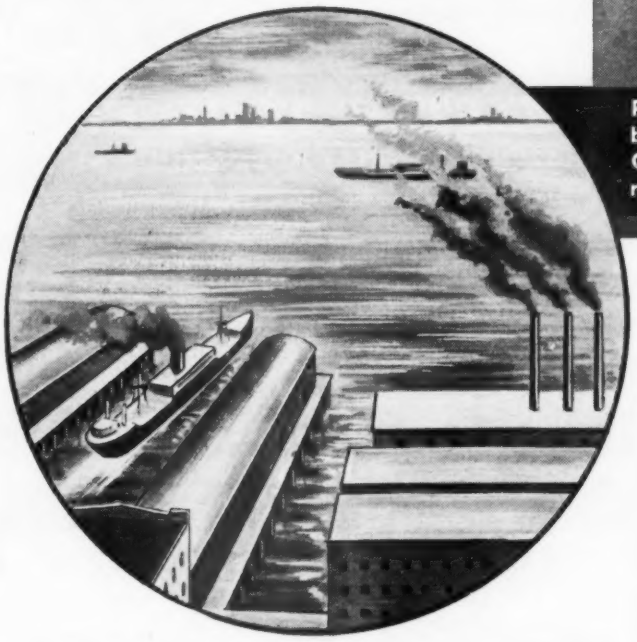

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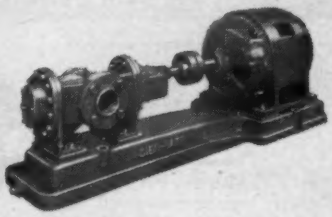

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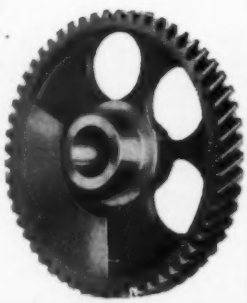

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SAVE TIME ON INTRICATE
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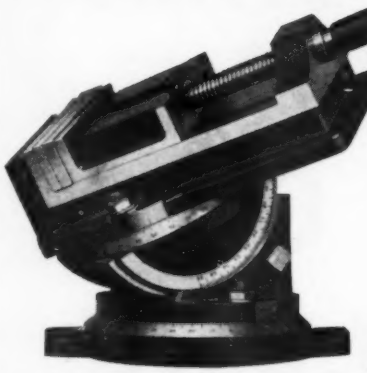
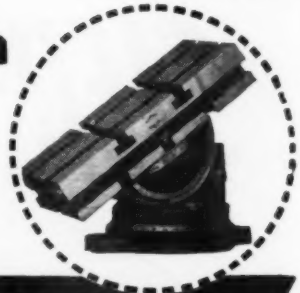
MULTI-SWIVEL VISE



Fully universal . . . three swivels simplify the setting of compound angles.

Parts interchangeable . . . can be used as a plain flanged vise, a swivel vise or a multi-swivel vise.



The Platen greatly increases the capacity of the unit. Vise and Platen are interchangeable.

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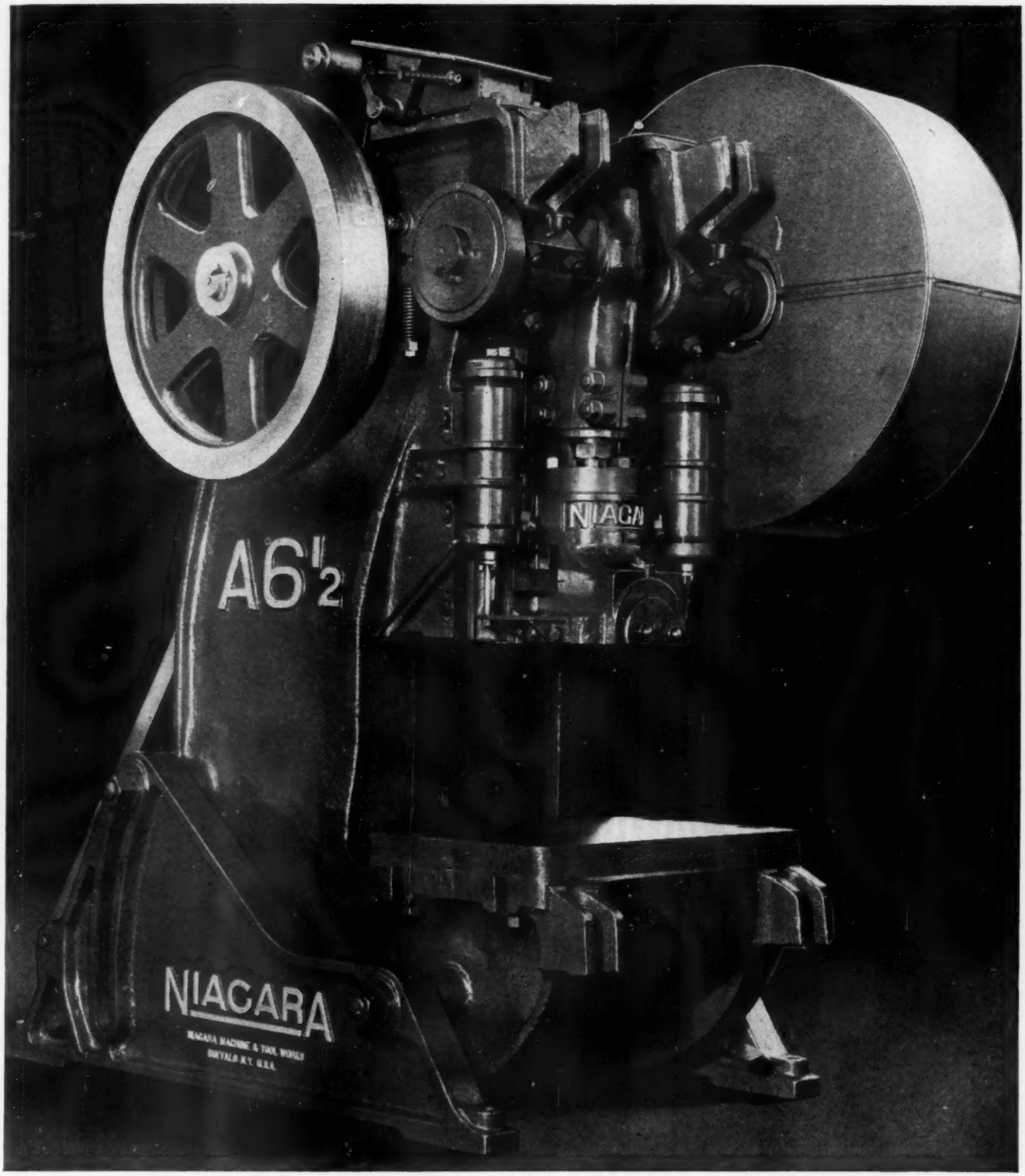

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11

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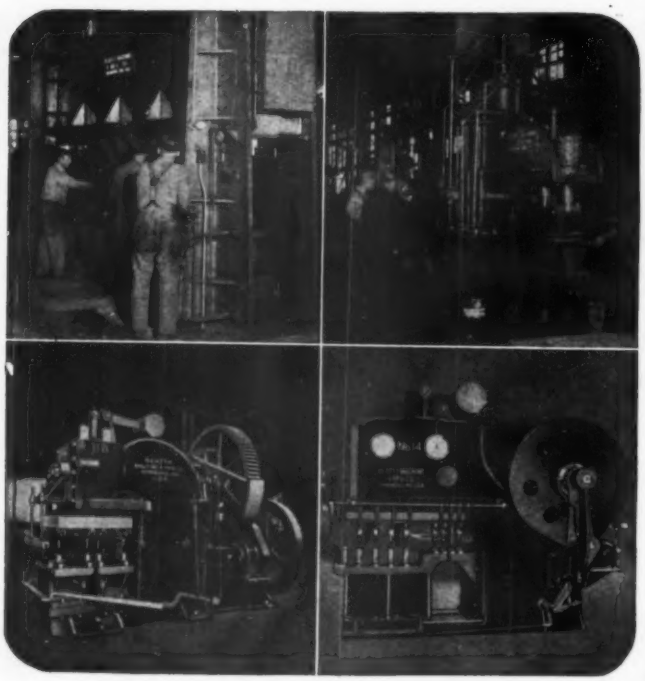

Representative units from the complete BEATTY line of heavy duty punches, presses, shears, coping machines, benders and bulldozers.

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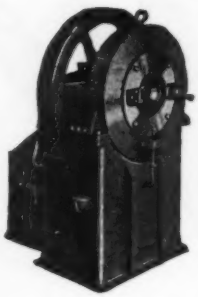

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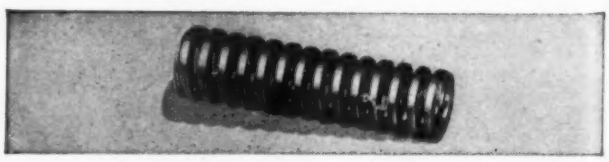

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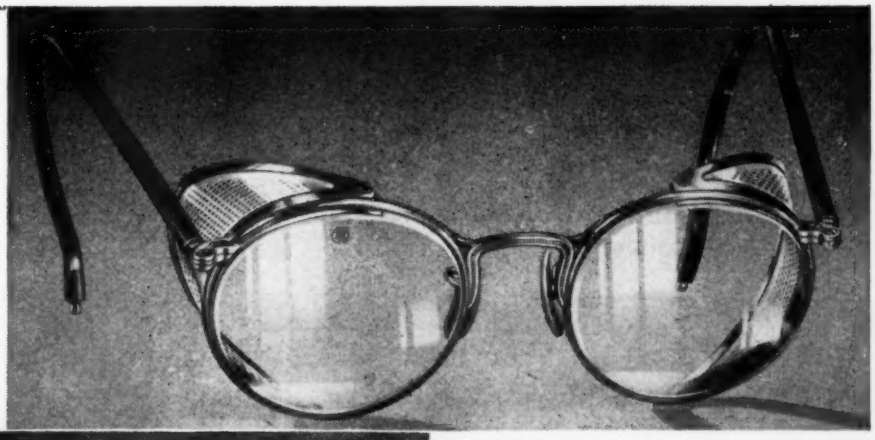
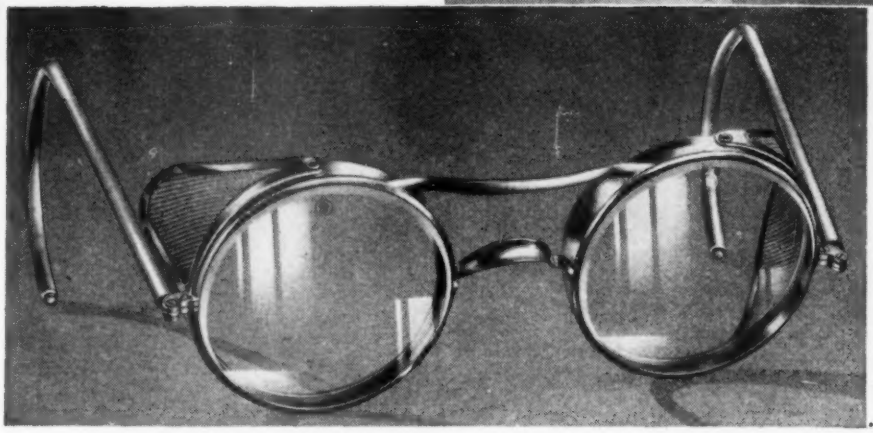
AO Ful-Vue Safety Goggles with wire mesh side shields afford extra protection against particles striking from sides.





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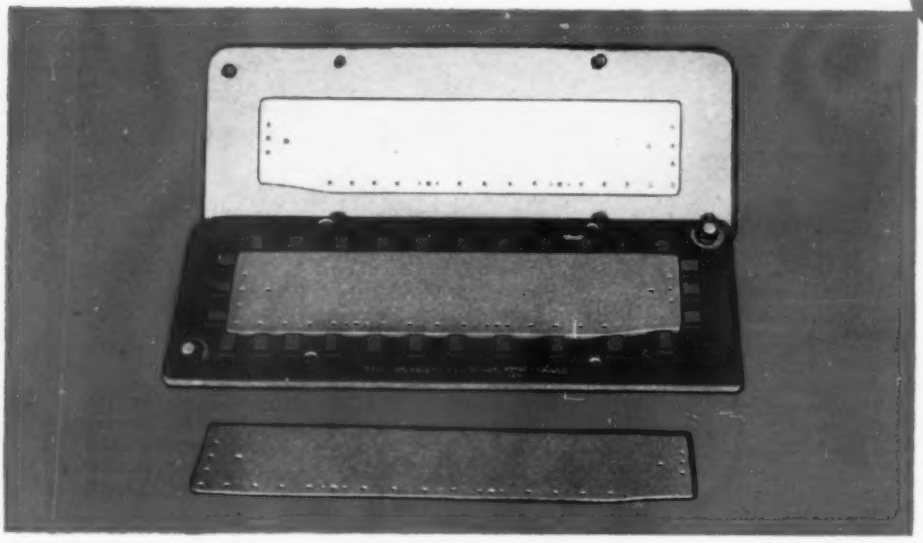
Tell us . . . the metal . . .the gauge . . . the size of the run . . . we'll quote quickly.



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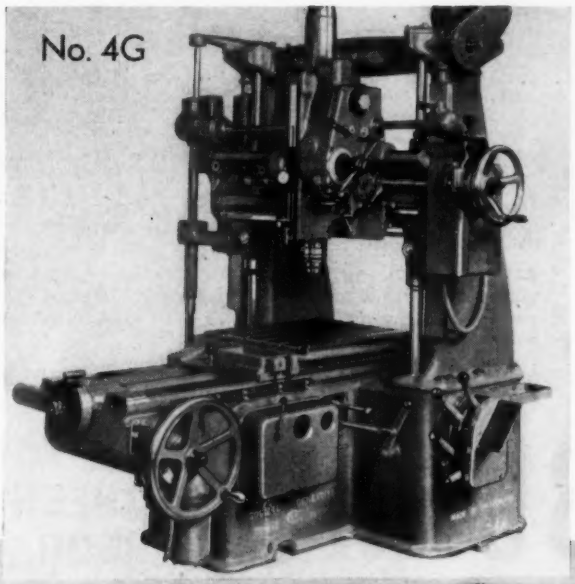
SIP JIG BORERS

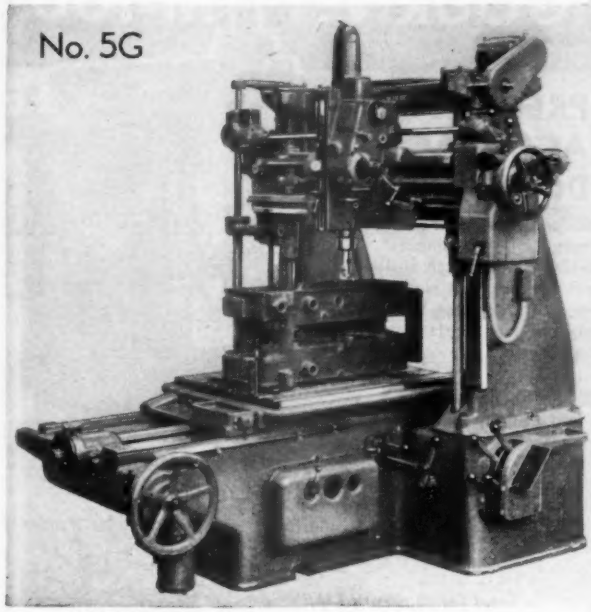


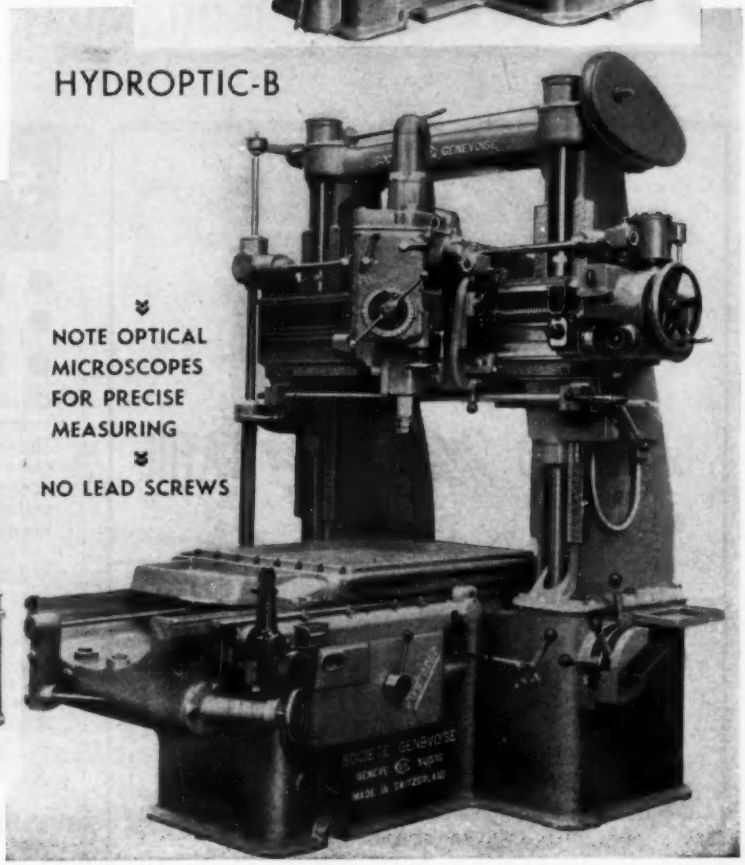
Again available to American industry—for ultra-precision performance and maximum production economy—are the five world-famed **SIP** Jig Borers ranging in capacity from the compact No. 2C to the generously dimensioned No. 5G, and including the improved ultra-precision Hydroptic-B (below, right). All are ruggedly built, retain their close accuracy even under the heaviest of mechanical stresses, and are recognized as "tops" by progressive tool and production engineers all over the world. Excellent deliveries on the five models listed below. Catalogs furnished upon request.

BELOW, RIGHT: Hydroptic-B performs milling as well as boring. Guaranteed accuracy to 0.0002" for all settings of work table and spindle head. Has no lead screws. Equipped with optical measuring system and microscopes for incredible accuracy.

Range of Table Sizes

No. 5G	43⅜" x 32"
Hydroptic-B	39½" x 32"





We also represent in the United States other world-famous Swiss High Precision Equipment: ANDRE BECHLER—MAAG GEAR WHEEL CO.—MIKRON—SAFAG—STUDER—SALLAZ—SCHAUBLIN—LIENHARD —BILLETER

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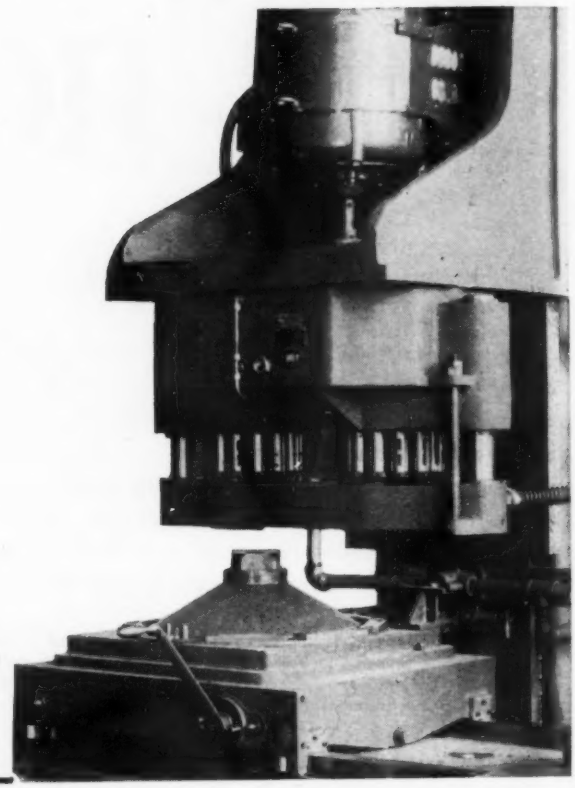
PLENTY TO MAKE

WITH *Buhr* RETOOLED MACHINERY



This equipment was non-productive until retooled by Buhr engineers.

The retooling consists of—

1—24 Spindle Drill Head arranged with twelve spindles for drilling and twelve spindles for reaming.

1—Two Compartment Bushing Plate with automatic cut-off of compound in non-operating section.

1—Holding Fixture mounted on rolling type index. Loading position left, drilling position center and reaming position right.

Safety devices prevent machine from operating until fixture is in proper position.

ALL GEARS IN BUHR DRILL HEADS are shaved and induction hardened for quieter, frictionless operation, lower power consumption and more trouble free production hours.

Let Buhr engineers help you retool for profitable production. Send blue prints or write us about your problems.

BUHR MACHINE TOOL CO.
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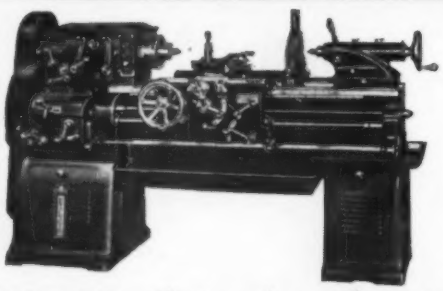

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features . . .

1. Oil Gages.
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3. Three Speed-Change Levers.
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1840—1945 CINCINNATI, OHIO

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- **ACCURACY**
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Careful engineering . . . rugged construction . . . combine in the Sigourney M-100 Bench Drilling Machine for lasting precision. Designed accuracy affords close tolerances . . . entirely enclosed parts insure maximum safety.

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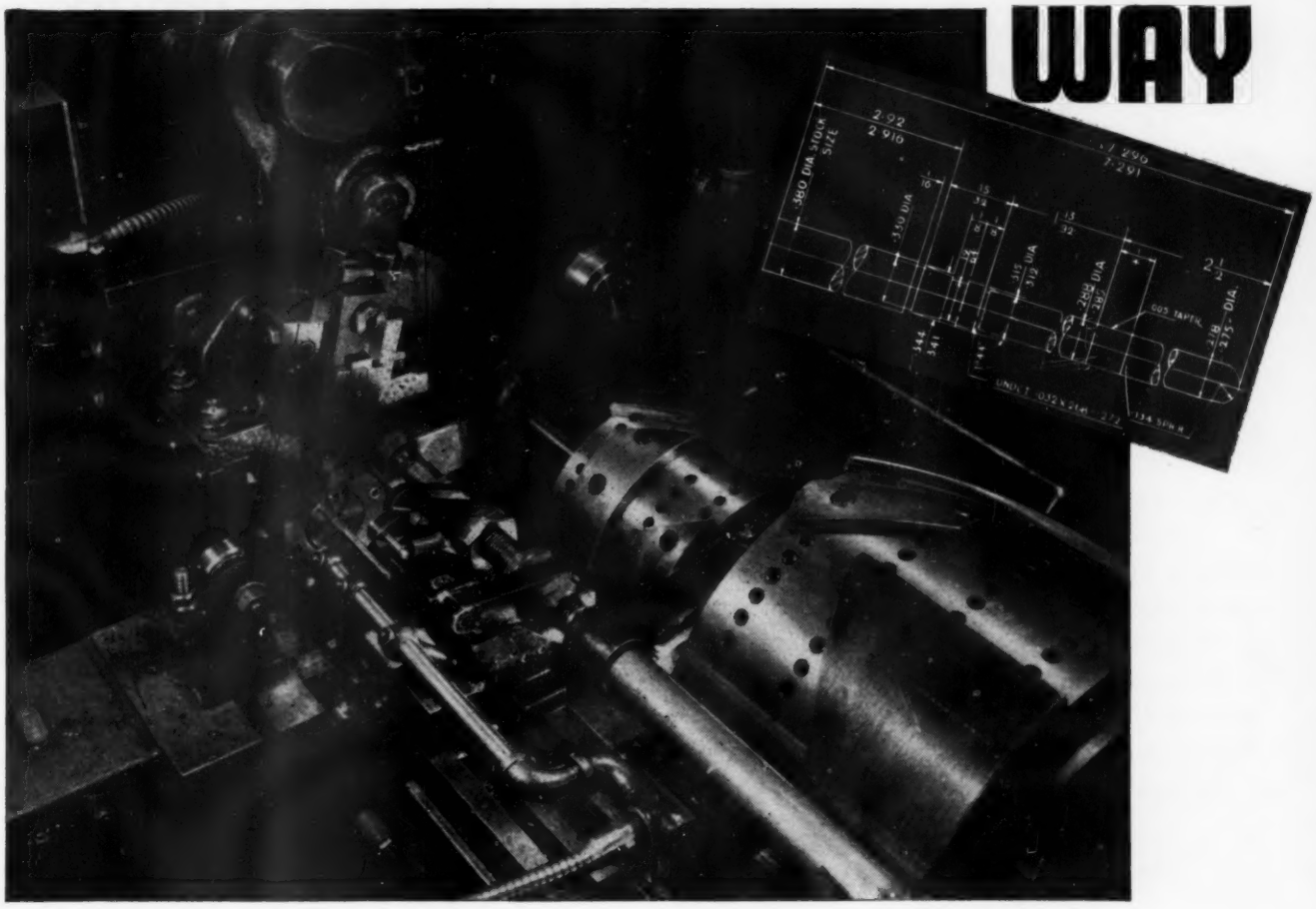
The CLEVELAND AUTOMATIC WAY



is the Low Cost Way

As in a majority of such jobs, the low-cost, high-production way to process the turntable shaft shown above was found to be the Cleveland way, with a Model B-1 1/16" single spindle machine set up for double gauging.

The stock is .380 Diameter SAE X-1112 ground bar. First gauge stop gauges 4 5/8" of stock. Milling slide, mounted with multiple tooling and roller rests, turns the .275" diameter, .285" diameter and the .134" radius end. Work is steadied on roller rests in milling slide as circular forming tool on front cross slide forms four diameters and short taper in center of shaft. Stock is then fed to second gauge stop (7.291") and independent cut-off delivers finished shaft. This job is run at 2200 RPM. Gross output approaches three shafts per minute.

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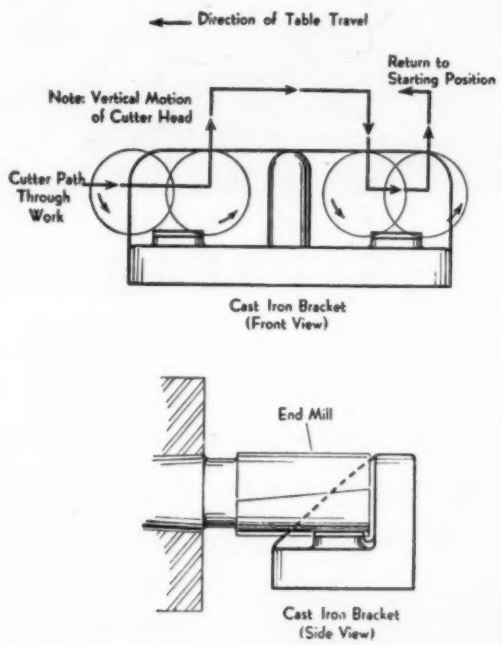
THE CLEVELAND AUTOMATIC MACHINE CO.

Simple Application of the U. S. MULTI-MILLER

(METHOD EMPLOYS INEXPENSIVE CLAMPING FIXTURE)

The line drawings (at the right) are the front and side views of a cast iron angle bracket with a central rib. At either side of the rib, on the horizontal portion of the bracket, there is a circular boss, the top of which is to be milled. The milling of the two bosses is easily handled on an MM-1-5-2 U. S. Multi-Miller utilizing an inexpensive clamping fixture—no indexing is required. The MM-1-5-2 U. S. Multi-Miller, as shown in photograph, is arranged with automatic, cam controlled, rise and fall motion of the spindle head. The table feed of the machine is also cam controlled, and operates in synchronization with the head movement to produce the desired result.

The line drawing shows direction of table movement from right to left—i.e., the apparent travel of the cutter through the work is from left to right. It will be observed that after milling the first boss, the spindle head automatically raises so that the cutter may clear the central rib. When in correct position above the second boss, the spindle head automatically descends and the second boss is milled. The head again ascends and the machine table returns rapidly to starting position.


Direction of Table Travel
Return to Starting Position
Note: Vertical Motion of Cutter Head
Cutter Path Through Work
Cast Iron Bracket (Front View)
End Mill
Cast Iron Bracket (Side View)

Our General Catalog contains complete specifications for the U. S. Multi-Millers. Ask for your copy. Quotation will be sent on receipt of part prints or samples.

U. S. TOOL COMPANY, INC.

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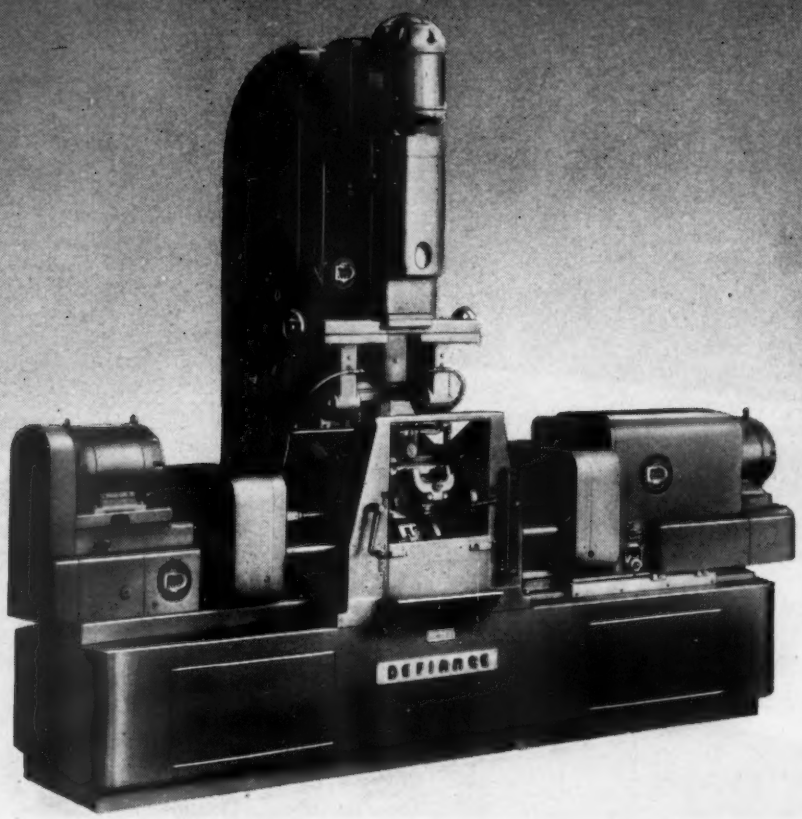
Builders of U. S. Multi-Millers—U. S. Multi Slides—U. S. Automatic Press Room Equipment—U. S. Die Sets and Accessories

HIGH PRODUCTION DRILL



● This three-way machine with five station indexing fixture shows the adaptability of Defiance Production Drilling Units to a production machine. These newly developed, greatly improved Defiance Cam and Hydraulic Units are available with standardized base and column design—for either horizontal or vertical mounting. Bases and columns are of welded steel to the dimensions required by the individual job . . . fixtures also specially designed for each job.

More and more shop men have learned through experience that Defiance-built Machines are "tops" in dependability, long life, and low-cost maintenance. Write for catalog.

Defiance Machine Works, Inc., Defiance, Ohio.

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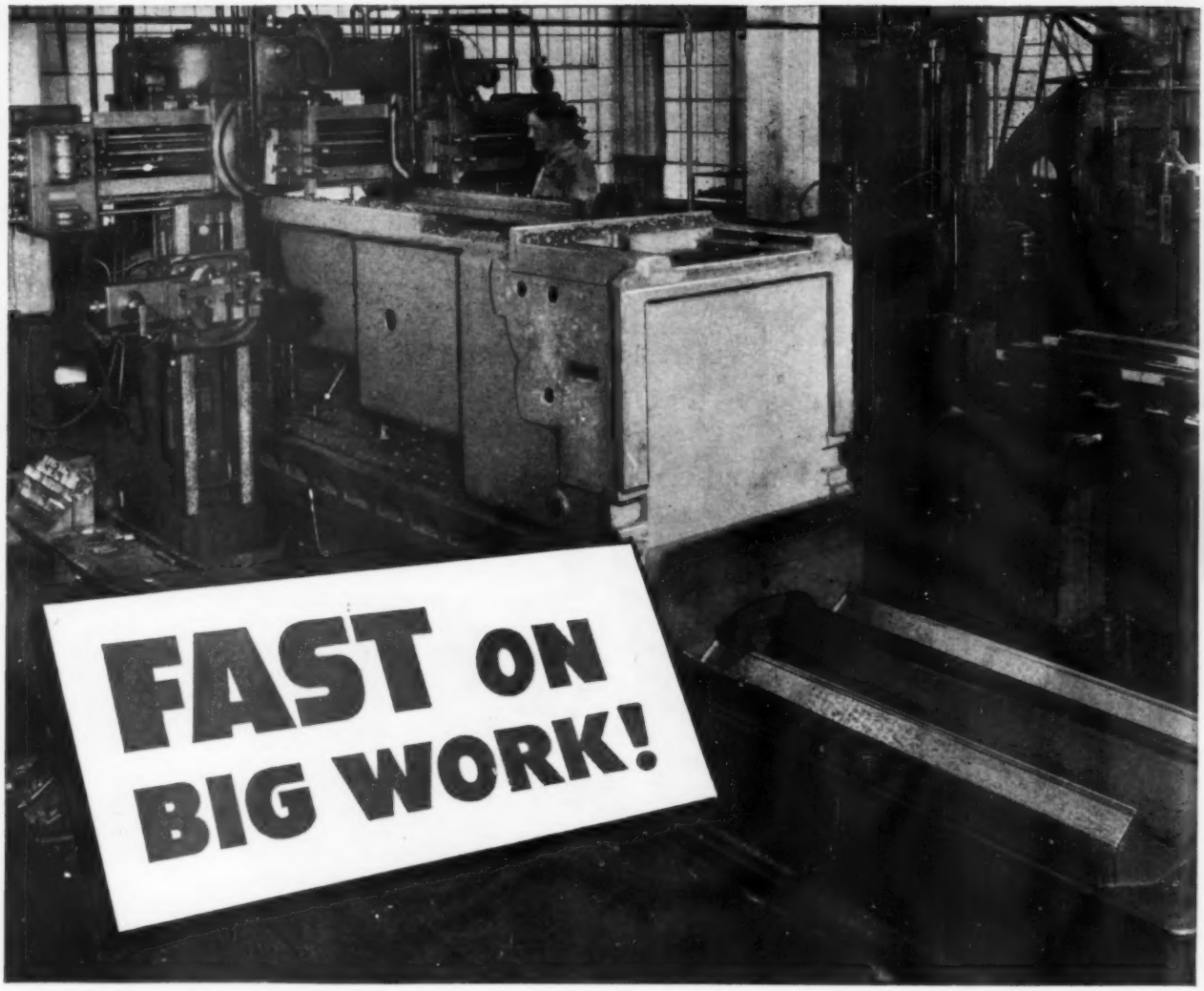
DEFIANCE

BUILDERS OF PRECISION MACHINERY SINCE 1850



In 13 hours floor-to-floor the Rockford Double-Housing Hy-Draulic Planer illustrated planes ten surfaces on the machine column shown. That's really *fast* for this job. Work-piece weighs some 10,000 pounds, is 11 feet 3″ long, 46″ in height above planer table, a husky hunk of cast iron for any planer to handle. An interesting feature is planing a narrow transverse rib. On this, the table-stroke isn't over 8″ and the speed is "right up there". Two rail-heads divide the work and walk across the width of the casting at almost shaper speed. The cushioned quick reversals and the accurate stroke control which make this possible are Rockford Hy-Draulic features that "pay off" on every chip; on every job, large or small.

Rockford Hy-Draulic Double-Housing Planers are made in four capacities, of which 60″ x 60″ is the largest. Maximum stroke-lengths of all sizes range from 10 feet to 20 feet, by increments of two feet. On big work, or on smaller work-pieces ganged, Rockford Hy-Draulic Double-Housing Planers are effective, economical, easy to operate . . . highly profitable investments. Write for details. Ask for Bulletin 1131.

4520

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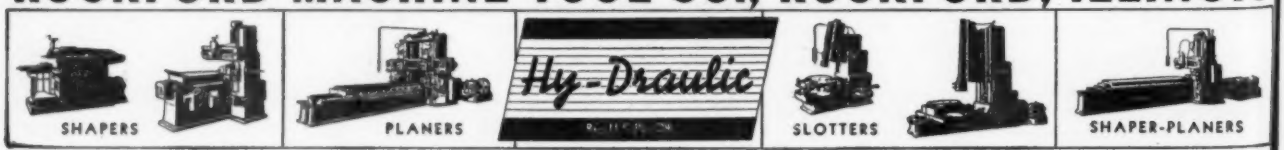
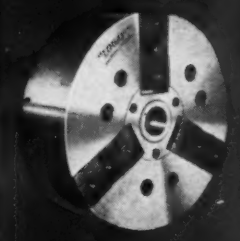
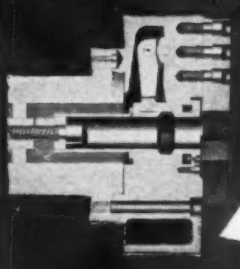
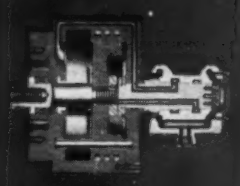


5 ways

Logan Hydraulic-Operated Chuck *Reduces Machining Costs* on Libby Heavy-Duty Turret Lathe







1 Reduces Chucking Time to Seconds
2 Eliminates Rejects and Spoilage
3 Maintains Accuracy and Finish
4 Reduces Idle Machine Time
5 Minimizes Operator Fatigue

• A standard Logan hydraulic-operated chuck—together with complete Logan hydraulic equipment—permits important savings in machining cost per piece on this Libby heavy-duty turret lathe application. Chuck jaws are opened and closed *in seconds* by simply moving the lever of the conveniently located control valve. This reduces chucking time per piece, saves operator time and machine time, and minimizes operator fatigue. As a result, production is profitably increased.

Constant, equalized pressure of the jaws prevents distortion of the work and automatically compensates for any loosening effect. Overhang is minimized in the Logan chuck, providing the rigidity which means improved accuracy and finish.

All elements of the complete hydraulic chucking system on this job are standard items in the Logan line—3-jaw universal chuck, hydraulic power unit with built-in relief valve, pressure gauge, rotating hydraulic cylinder and control valve.

Air-operated chucks, controls and accessories are also available. Logan hydraulic and air-operated chucks come in a wide range of standard sizes and types. Special chucks can also be supplied for unusual chucking applications.

Logan engineers will be glad to make recommendations for the installation of hydraulic or air-operated chucks, and can supply layouts showing the most efficient methods of installation on any chucking equipment. No charge or obligation for this service.

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Logan

Air and Hydraulic Equipment

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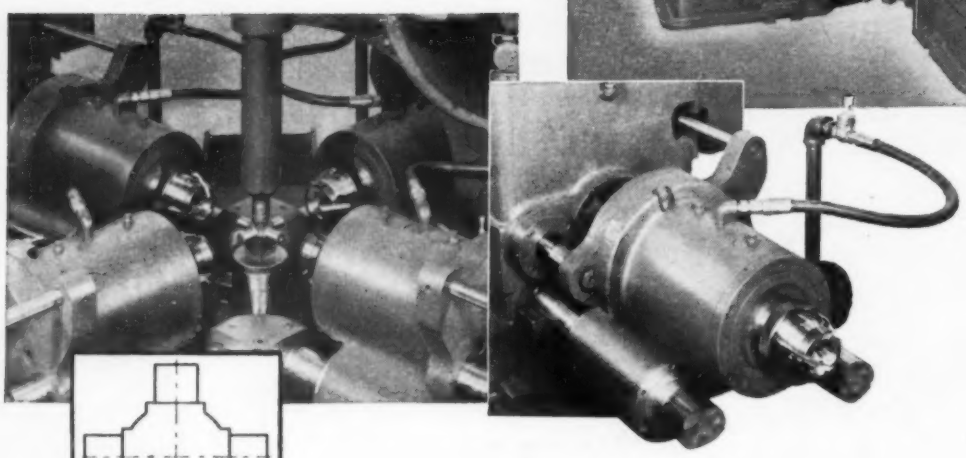
LOGANSPORT
INDIANA

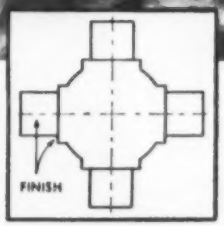
CHUCKS • CYLINDERS • VALVES • PRESSES • SURE FLOW COOLANT PUMPS

FREE . . . *catalogs of Logan chucks; hydraulic cylinders, valves and power units; air cylinders and accessories. Write today.*

And Now!

A HOLLOW MILLING MACHINE *for* HEAVY DUTY WORK





COMPOSED of 4 standard LeMaire No. 5000 hydraulic power units—mounted on standard end bases which in turn, are fastened to a center base—this special-purpose machine has many features to distinguish its efficient performance.

Power furnished to the spindles is independent of that supplying the hydraulic pumps. The AC motors on top maintain a constant pump speed unaffected by any variations in speed that might be desired in cutting-speed of spindles. The latter are powered by DC motors having variable speed control — by rheostat for infinite spindle speeds and by flow valve for infinite feeds.

The front bearing of the opposed Timken bearings, in which the spindles run, is positioned close to cutter, providing minimum front overhang to cutting tool. High pressure coolant is forced through spindles assuring chip removal.

The air-operated fixture has electric interlock to prevent cycling of machine before part is clamped. A nest arrangement, used to locate part in fixture, facilitates change-overs.

This machine was designed to hollow mill and face shoulder on universal joint spiders having journals ranging from ½" to 1⅛". Production on ¾" dia. x ¾" length journals is approximately 180 pieces an hour.

Again, this machine demonstrates the versatility of the Twin Ram Hydraulic Units—how you can make an efficient special-purpose machine to meet your particular requirements very simply and economically.

Send for folder giving complete specifications and information regarding these efficient units.

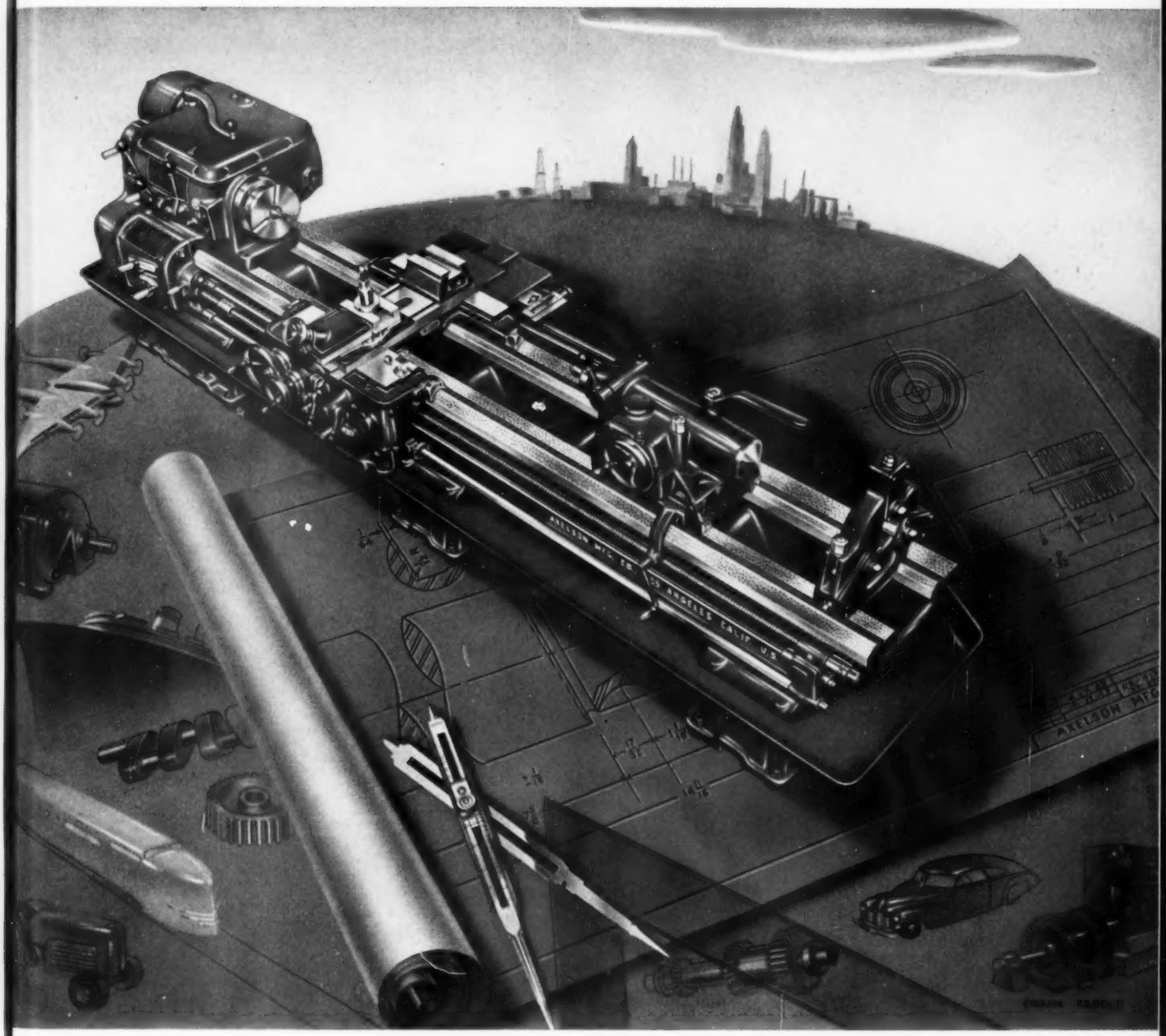
LeMaire PRECISION PRODUCTS

LeMaire

BUILDERS OF
SINGLE AND MULTIPLE SPINDLE MACHINES
FOR BORING, DRILLING, REAMING,
TAPPING, ETC.—TWIN RAM HYDRAULIC
UNITS—MATCH-IT GEAR CHUCKS

LEMAIRE TOOL & MFG. CO. • 2657 S. TELEGRAPH ROAD • DEARBORN, MICHIGAN

Implement for World Comeback



The effects of war upon the world have dammed up a huge pool of "comeback" orders through the great structural damage done and the long delay in civilization's progress... Vital to industry, as production of consumer goods commences to meet growing market demands, is the heavy-duty Lathe... Axelson's 24-speed selective type geared head engine Lathe, in various lengths and six sizes, is a blue-ribbon machine tool. This Lathe is built on a quality first standard and backed by thirty years of precision manufacturing progress... As an implement of world industrial recovery the *Axelson Lathe*, for speed, dependability, versatility and low per-piece cost on any class of work, stands proudly on a record of unfailing performance wherever close tolerance metal turning is demanded.

AXELSON LATHES

Dependable for Over a Quarter Century

ARMY E NAVY

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

AXELSON MANUFACTURING CO., 6160 S. Boyle Ave. (Box 98, Vernon Station) Los Angeles 11, Calif. ★ 50 Church St., New York City 7, N. Y. ★ 3844 Walsh St., St. Louis 16, Mo.

Axelson Lathes of various lengths are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

Bridgeport

TURRET MILLING MACHINE

Ability to mill, drill, bore and shape *at all angles* without changing set-up, is a feature of the "Bridgeport" which makes it such an invaluable machine for post-war use. Whether in the tool room or on the production line, its versatility assures its being kept busy on single piece or quantity work, increasing productive machine hours and output per man. This means that high volume can be achieved at lowest cost by replacing obsolete equipment with the "Bridgeport."

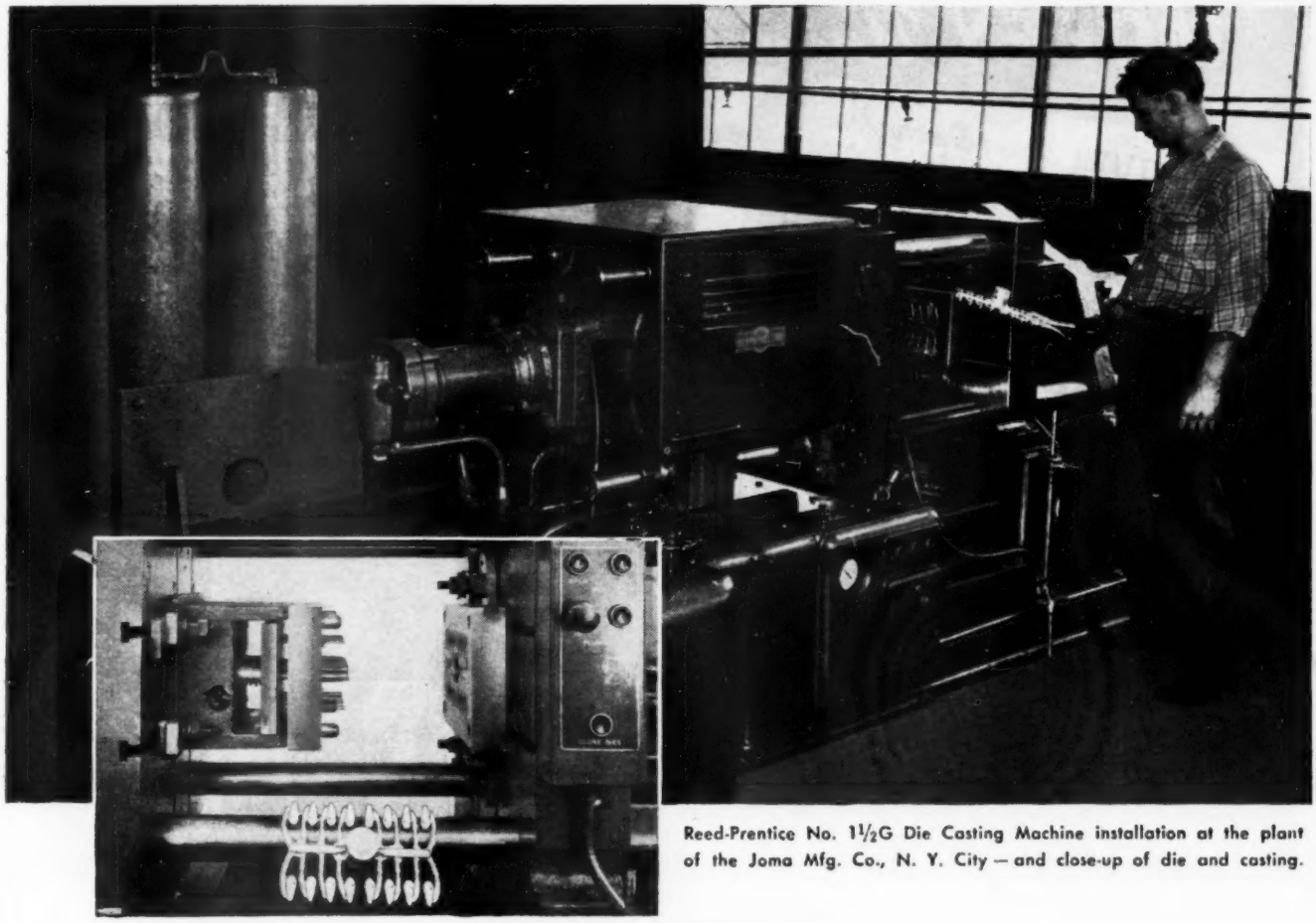
Specifications

Longitudinal Feed ..... 20"
Cross Feed ..... 9"
Vertical Feed of Knee ... 16"
Standard Table ..... 9" x 32"
Special Tables up to 48" available; also longitudinal power feed
Weight with Shaping Unit—2000 lbs.

●

Full Information on the Bridgeport Turret Milling Machine is available promptly on request.

The **Bridgeport**
MACHINES, Inc.
Bridgeport, Conn.



Reed-Prentice No. 1½G Die Casting Machine installation at the plant of the Joma Mfg. Co., N. Y. City — and close-up of die and casting.

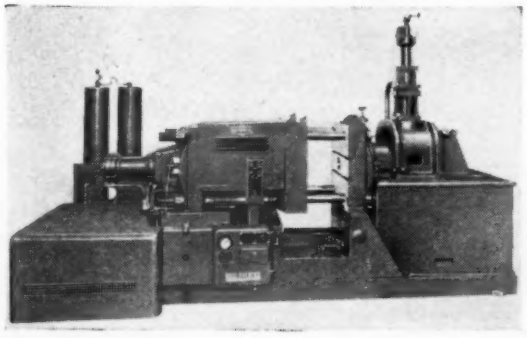
ADAPTABILITY . . .

Now is the time when adaptability counts — as demonstrated by the Joma Mfg. Co. — who lost little time in reconversion with Reed-Prentice die casting machines!

Production goes on — war or peace — as this firm manufactures a series of castings for an aluminum cigarette lighter — each casting weighing approximately .023 lbs., made from a 16 cavity die, turning out 50 to 75 shots per hour for the smokers of the World.

Die locking mechanism, centralized controls, safety devices — and other important construction features of this machine for casting aluminum, magnesium or brass alloys, is explained in detail in a descriptive circular. Write for it now! Also available in larger capacity—Model 3-G.

Zinc attachment for No. 1½G Model, designed for quick mounting, available at extra charge.



Model No. 1½ Reed-Prentice Die Casting Machine for zinc, tin or lead base alloys.

DIE CASTING
REED-PRENTICE CORP.
WORCESTER MACHINES MASS., U.S.A.

NEW YORK OFFICE: 75 West St., NewYork 6, N. Y.
CLEVELAND OFFICE: 1213 W. 3rd. St., Cleveland 13, Ohio

MOREY *Universal* TURRET LATHES
for BAR or CHUCKING

THE TURRET LATHE *Your Operator* APPROVES!

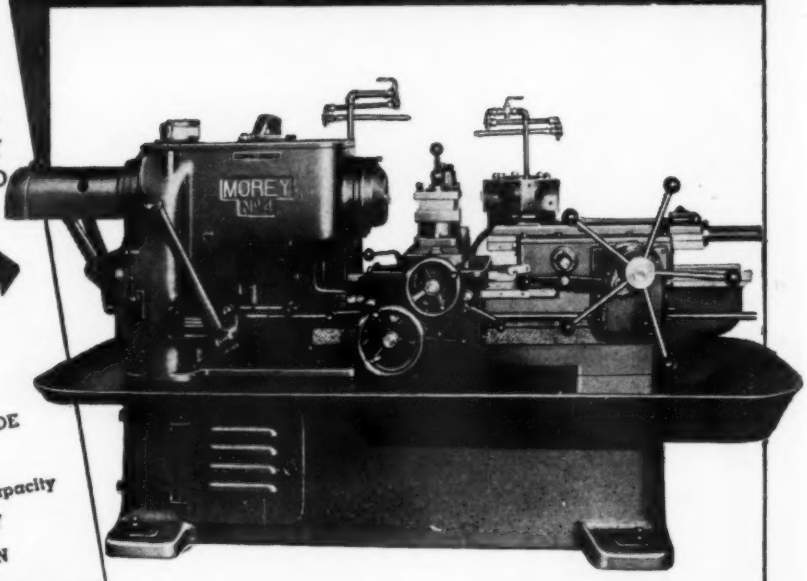
EASY TO OPERATE • ACCURATE
DEPENDABLE • RIGID AND
POWERFUL ENOUGH TO FULLY
UTILIZE PRESENT-DAY HIGHSPEED
CARBIDE TOOLS

#4 UNIVERSAL

For bar stock up to 2" in diameter
12' turning length 19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM.
constant speed motor, 1200 RPM
MAY BE HAD WITH PLAIN CROSS SLIDE

Also available in
No. 3 Universal, 1½" capacity
No. 2 Plain, 1" capacity

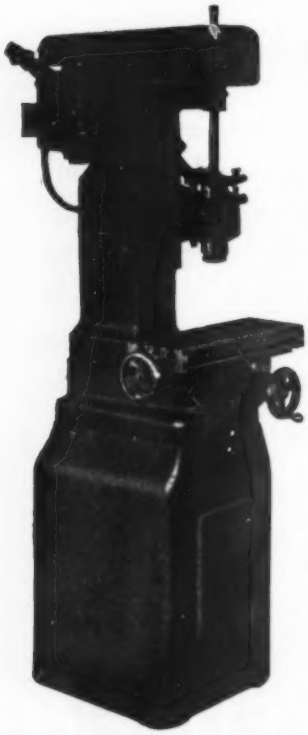
ASK FOR DESCRIPTIVE BULLETIN



STOCK DELIVERY

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC 410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

IT'S **LITTLE...** BUT ***WHAT* A JOB**
IT CAN DO!
WHERE WORK PILES UP IN BUSY SHOPS



Let the Linley save larger machines for work they were built for . . . this compact unit fits snugly in any 2½ ft. space . . . mills and bores a wide variety of jigs, dies, patterns, fixtures and models . . . quickly, accurately, economically.

Has eight velvet-smooth spindle speeds . . . 275 to 4250 r.p.m. . . . to fit every need in hard pressed tool rooms.

Odd jobs scheduled on the wrong machines eat up profits. Linley can save machining pennies that add up to production dollars on the books. Look into this money-maker.

Write for bulletin now.

LINLEY BROTHERS COMPANY
664 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

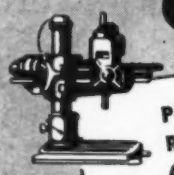
Sensitive DRILLING MACHINES
Avey
CINCINNATI OHIO

LUERS Patented Cutting Off Tool Holders
Patented Cutting Off Blades

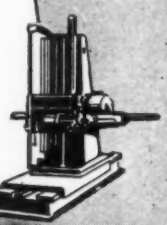
ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License issued by John Milton Luers Patents Inc.

GILBERT



PRODUCTION SPEEDING
RADIAL DRILLS
AND
HORIZONTAL
DRILLING, BORING
AND MILLING
MACHINES



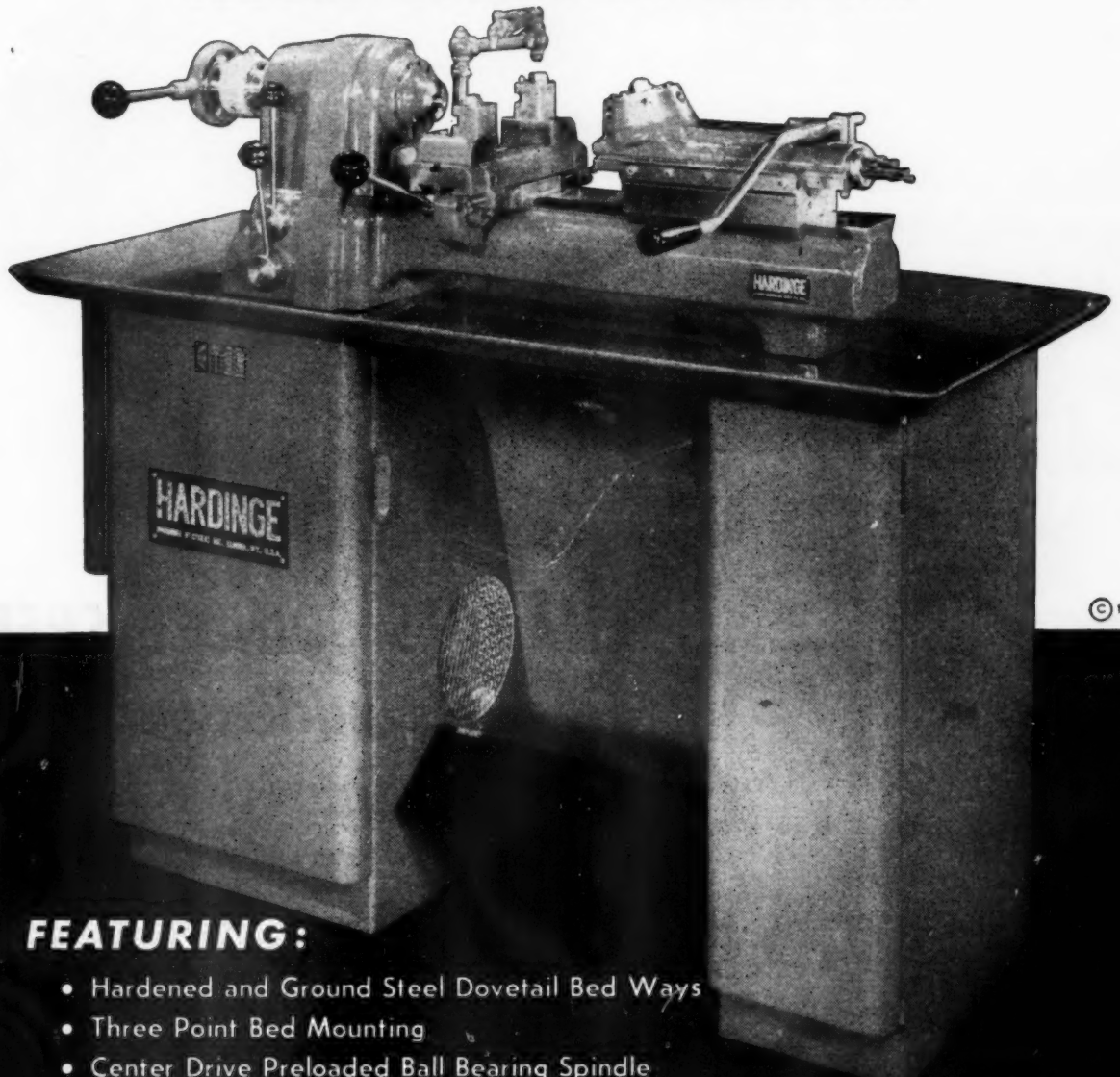
DETAILS ON REQUEST

THE CINCINNATI GILBERT MACHINE TOOL CO.
CINCINNATI, OHIO

HARDINGE
ELMIRA, N.Y.

ANNOUNCING A NEW MODEL

HIGH SPEED PRECISION
SECOND OPERATION MACHINE



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FEATURING:

- Hardened and Ground Steel Dovetail Bed Ways
- Three Point Bed Mounting
- Center Drive Preloaded Ball Bearing Spindle
- Hardened and Ground Steel Ways in Turret
- Preloaded Ball Bearing Turret Head
- Complete Built-in Electrical Equipment

Write for Bulletin DSM 59

HARDINGE
DOVETAIL BED
1" Collet Capacity – 9" Swing

HARDINGE BROTHERS, INC., ELMIRA, N. Y.
"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

LELAND GIFFORD INDICATING SHIFT

CHANGES SPINDLE SPEEDS or shifts back gears without stopping the machine.

LELAND GIFFORD No. 2-LMS

motor spindle machine with Indicating Shift saves valuable hours of production time. No trusting to memory, no hunting for charts for correct spindle speeds for different drills in a variety of materials. Just turn the hand wheel and right before the operator's eyes appears all the information that he is seeking.

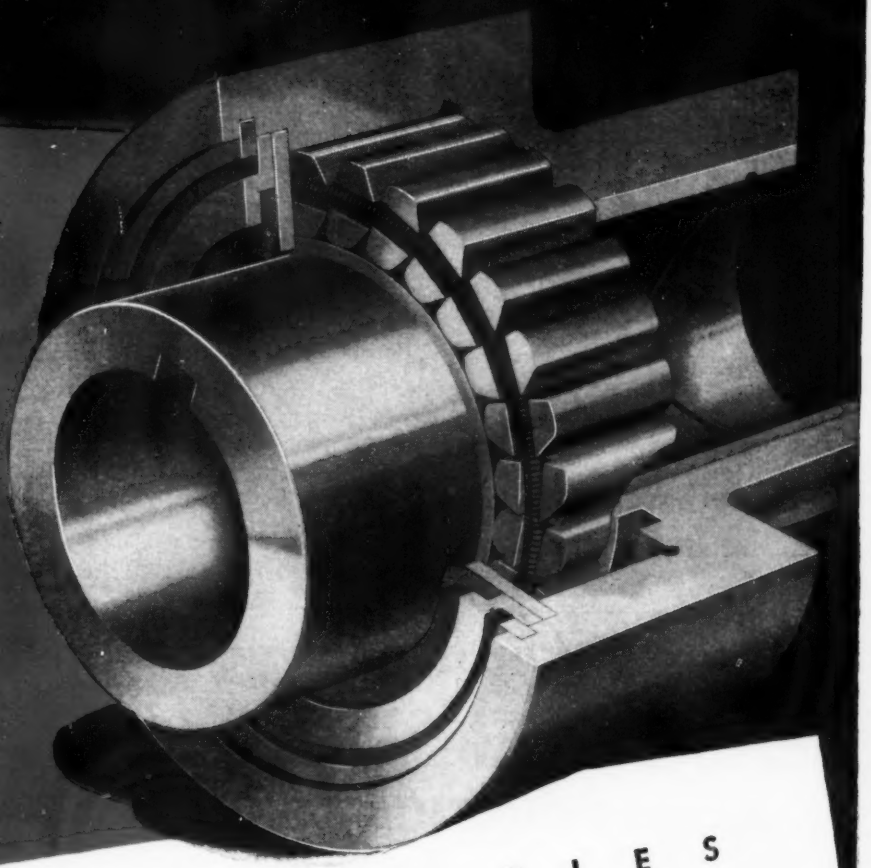
LELAND GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

FORMSPRAG

THE FULL COMPLEMENT

Over-Running Clutch



● Formsprag has an extremely high torque capacity. It is compact, simple and rugged. It is instantaneous in action, without lost motion or backlash, and over-runs freely on the slightest reduction in speed of the driving member.

Torque is applied by the gripping action of a large number of energized sprags that completely fill the annular, cylindrical space between the driving and driven members. There are no external or internal cam surfaces—no spots where localized wear can develop.

All sprags are hardened, with contours accurately form-ground to a shape that insures positive, non-slipping driving action, quick release and long life.

ARMY E NAVY

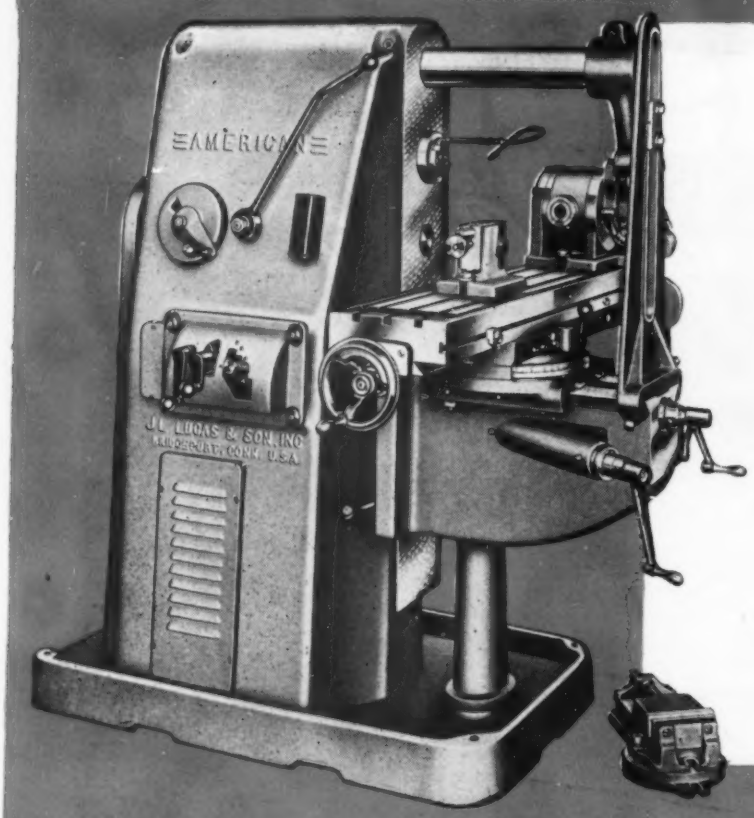
Descriptive Literature on Request

C A P A C I T I E S

● Formsprag Over-Running Clutches are available in both plain and ball bearing types, in a wide range of capacities. When writing for literature, it will be appreciated if you will send a description of the operation, normal and maximum torque at specified speeds, number of times per minute the clutch engages and disengages, and other pertinent information.

The GEAR GRINDING MACHINE COMPANY

DETROIT 11, MICH. U.S.A.



EXPLORE THE POSSIBILITIES *of the No. 2* AMERICAN PLAIN and UNIVERSAL MILLING MACHINE ON YOUR WORK

Offering infinite spindle speeds—Motor in base drive—Standardized spindle nose—heavy rugged construction—versatility for a wide range of work.

The following specifications apply to both Plain and Universal Types

TABLE—Working Surface—46"x10½"
T-slots—3-11/16"

RANGE—Longitudinal Power Feed—25"
Transverse Power Feed—9"
Vertical Hand Feed—17"
Max. Distance spindle to table—17"

SPINDLE—Standardized Flanged Nose—No. 40 Taper
Hole through spindle—21/32" dia.
Length Front Bearing—5"
Speeds—Infinite—Range 25-500 RPM

FEEDS—16

OVERARM—Dist. to center of Arbor—6½"

FLOOR SPACE—85"x68"

Prompt Deliveries Now Available

J. L. LUCAS & SON, Inc.
BRIDGEPORT, CONN.

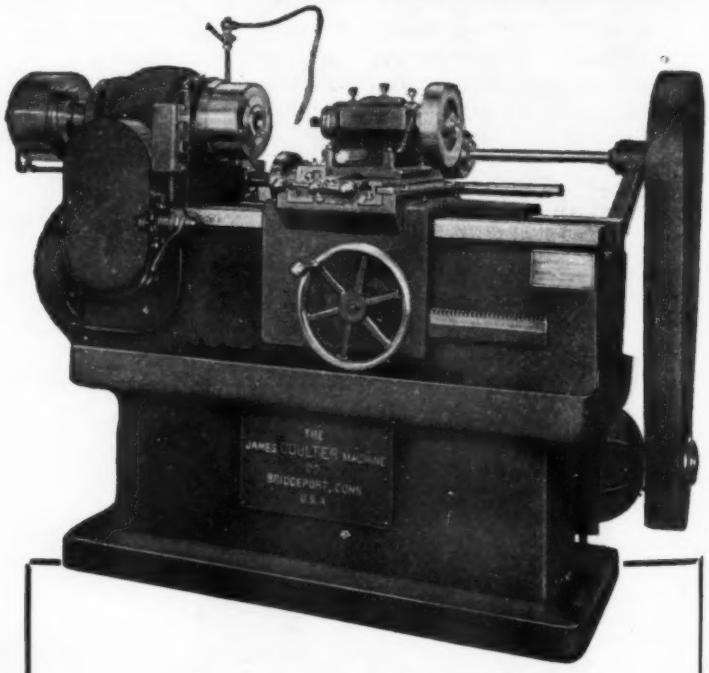
Send for Illustrated literature—

Keep Ahead of DEFENSE DEMANDS *on the PRODUCTION of* EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.



Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT · CONNECTICUT · U.S.A.

"WHERE SMOOTH SURFACES ARE A FIRST REQUIREMENT . .

. . We Use Sunnen Portable Cylinder Hones"

LOCKHEED AIRCRAFT CORPORATION

On landing gear assemblies, bushings, actuating cylinders, etc., Lockheed Aircraft Corporation has found that Sunnen Portable Cylinder Hones do an outstanding job. In most instances the metals used are very hard and the honing must remove scratches and distortion, and produce a mirror-smooth finish. A typical example of this kind of work is shown in the illustration above, where a Lockheed worker is honing a sleeve of a landing gear part.

The Sunnen Portable Cylinder Hone will produce a straight, true hole with a guaranteed accuracy of .0005"— and a surface finish of from 2 to 3 micro-inches. It will correct errors of out-of-round and taper; is portable — can be taken to the job; operates in any position without misalignment; maintains original alignment of bore; is simple to use and works in any metal except lead or babbitt.

If you have an internal finishing problem, call a Sunnen engineer for assistance — or write for free bulletin.

Standard Model — Size range 2 11/16" to 14 1/2"

Junior Model — Size range 2" to 2.6"

SUNNEN PRODUCTS COMPANY

7941 Manchester Avenue St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

SUNNEN

IF YOU'RE LOOKING FOR

TRULY HIGH PRODUCTION

investigate this

PORTER-McLEOD COLD METAL SAWING MACHINE

Your problem of relieving bottlenecks in cutting-off operations and keeping production moving at top speed can be solved by this 8" powerful, convenient Porter-McLeod machine.

With a capacity for cutting 8" round or 7½" square stock and arranged so that stock can be nested for multiple cuts together with a standard feed of 3" per minute, a wide variety of work can be cut on a high production basis.

Speed with safety and accuracy is assured by pulling the blade upward through cut, with blade supported close to its rim to eliminate the possibility of buckling and weaving. A friction disc feed insures against blade damage and breakage. Blade design is such that every tooth cuts.

Get all facts today concerning this fast, accurate, straight-cutting machine. Write for Illustrated, Descriptive Bulletin.

PORTER-McLEOD MACHINE TOOL CO., INC.
HATFIELD, MASS., U.S.A.

SHELDON *Vernon*

Now Available!

Coming off the new production lines in Chicago, the SHELDON-built SHELDON-Vernon Precision Machine Tools* are now available at the same moderate prices that made them first in the moderate priced field. Built in the new modern SHELDON plant which is equipped with every advanced machine tool building facility, they are better than ever—even more accurate, more rugged and better finished.

Lighter and smaller and less costly than machine tools of equal accuracy, they provide a faster, more convenient and economical means of doing all but the heaviest operations.

Write for Bulletin on:

*SHELDON-Vernon Horizontal Milling Machine

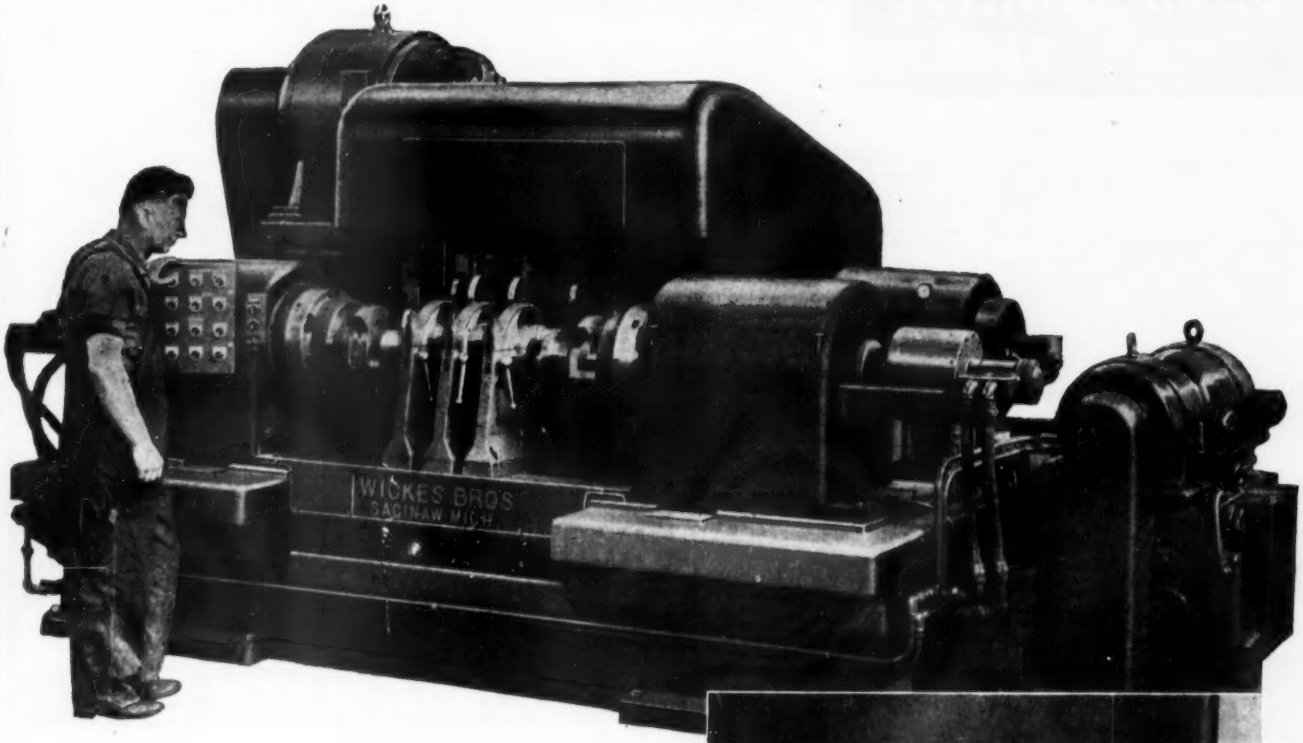
*SHELDON-Vernon Vertical Milling Machine and Jig Borer

*SHELDON-Vernon 12" Shaper

Builders of Good Lathes Since 1919

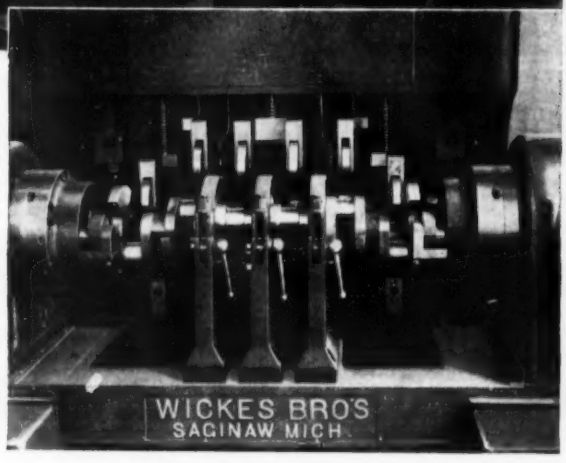
SHELDON MACHINE CO., INC.
4234 N. Knox Ave., Chicago 41, U.S.A.

WICKES MODEL MP-8 AUTOMATIC MULTIPLE CRANKPIN TURNING LATHE



Automatically Turns All Crankpins Simultaneously On Heavy Crankshafts

The Wickes Model MP-8 Heavy Duty Single Spindle Automatic Multiple Crankpin Turning Lathe cheeks, turns and fillets all crankpins simultaneously on heavy multiple throw crankshafts required for aircraft, marine and similar large engines. This lathe is of the very latest design and is extremely rugged making it suitable for the heaviest of roughing cuts. This same rigidity also makes the lathe capable of the very smoothest of finishing cuts with extreme accuracy in stroke, index, diameter and spacing of crankpins.



Inset shows tooling arranged for turning all crankpins on 6-throw aircraft crankshaft.

The control of the lathe is entirely automatic through electrical push button panel, it being necessary only for the operator to load crankshaft and depress electrical push button and machine goes through entire work cycle automatically and stops in unloading position. Write for complete information.

Wickes

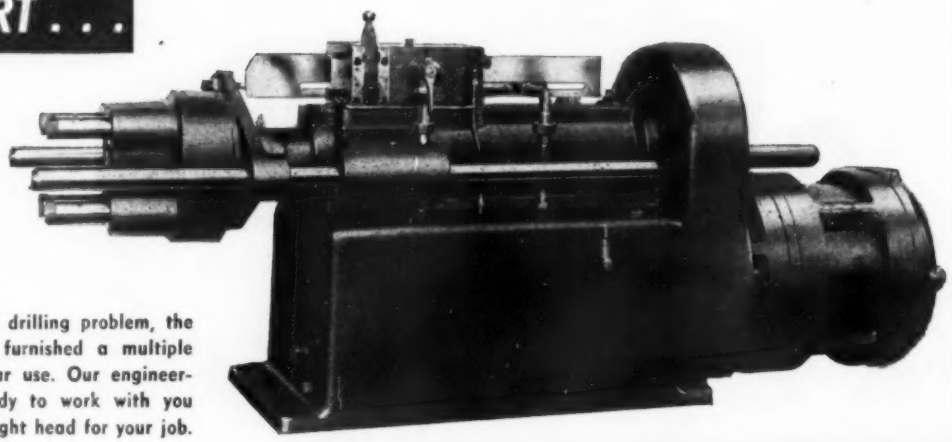
WICKES BROTHERS • SAGINAW, MICHIGAN • RECOGNIZED QUALITY SINCE 1854

CRANKSHAFT TURNING EQUIPMENT • DOUBLE-END BORING, HEAVY DUTY ENGINE, SPECIAL PRODUCTION LATHES • SIMPLEX BLUE PRINTERS

4 SPINDLE HOEFER HEAD ELIMINATES SEPARATE HANDLING OF AN UNWIELDY PART . . .

★ A 5 H. P. Hoefer Hydraulic Unit on which is mounted a 4-spindle Hoefer Head carried on guide bars. Tied into the fixture through a mounting bracket, the head became a part of a large Ingersoll Multi-Station Boring Machine performing operations on a tractor crank case. The four holes are at a 30-degree angle to all other operations and are done during the time of the other operations. The control is hydraulic, automatically starting our unit with its 4-spindle head by the index plunger of the trunnion entering its bushing. In this way a separate handling of an unwieldy part was eliminated and the extra jig for these holes was not necessary.

In our more than thirty years of concentrated effort in designing and building Multiple Spindle Heads we have produced this equipment for unlimited applications and in designs of every conceivable construction.



If you have a multiple drilling problem, the chances are we have furnished a multiple spindle head for similar use. Our engineering department is ready to work with you now to determine the right head for your job.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

MILLHOLLAND

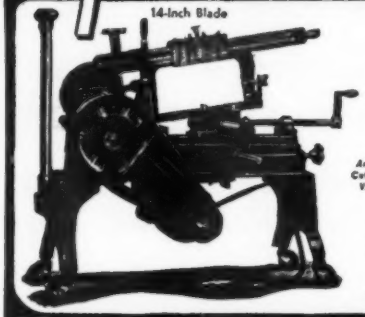
Automatic **DRILLING - BORING MILLING - TAPPING** Units

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

POWER HACK SAW ★



LOW PRICED
SELF-CONTAINED
PORTABLE
STURDY
READY TO WORK
ECONOMICAL

EXPORT DEPT.
1111 SO. FERRY BLD'G.
NEW YORK 4, N.Y.

WRITE FOR BULLETIN NO. 400

MILLER-KNUTH MFG. CO. OMAHA, NEB.

CARLTON RADIAL DRILL

FEATURES — 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

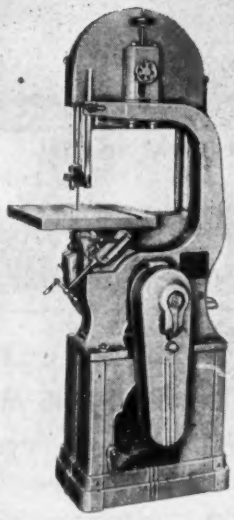
The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

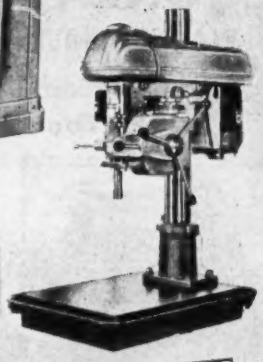
Walker-Turner

MACHINE TOOLS' WIDE SPEED RANGES CUT MACHINING COSTS!

RADIAL DRILL
16 Speeds from
160 to 8300 R.P.M.



BAND SAW
8 Speeds from
61 to 5300 S.F.M.



20" DRILL PRESS
5 Speeds from
210 to 5200 R.P.M.

● Using the *correct* cutting speed for every operation and material pays off in faster machining—fewer damaged tools and blades —cleaner, more accurate production. This all adds up to *lower cost per piece!*

Exceptionally wide speed ranges with ample adjustments between "high" and "low" enable Walker-Turner Machine Tools to cut costs substantially. The Radial Drill's jackshaft assembly and the Band Saw's backgearing and cone-pulley arrangement are examples of this advanced designing. Write today for detailed catalog.

WALKER-TURNER COMPANY, INC.
PLAINFIELD, N. J.

MORE FOR YOUR MACHINE-DOLLAR
with prices like these!

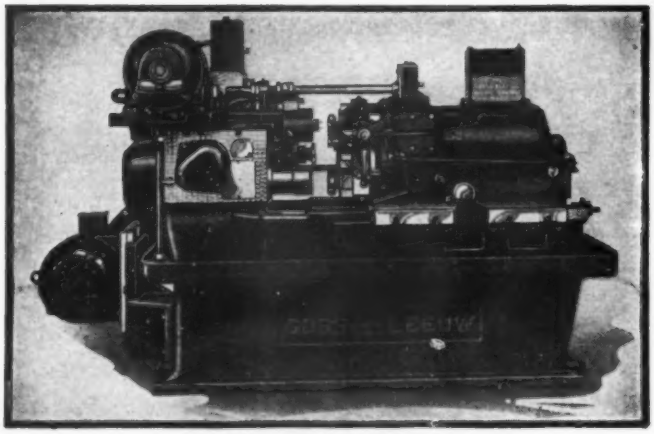
RADIAL DRILL—$352.50 less base and motor.
14" BAND SAW—$127.50 less base and motor.
20" DRILL PRESS—$255.00 less motor. (Slightly higher west of Rockies and in Canada).

walker-Turner
COMPANY, INC.
PLAINFIELD, N.J.
U.S.A.

MACHINE TOOLS

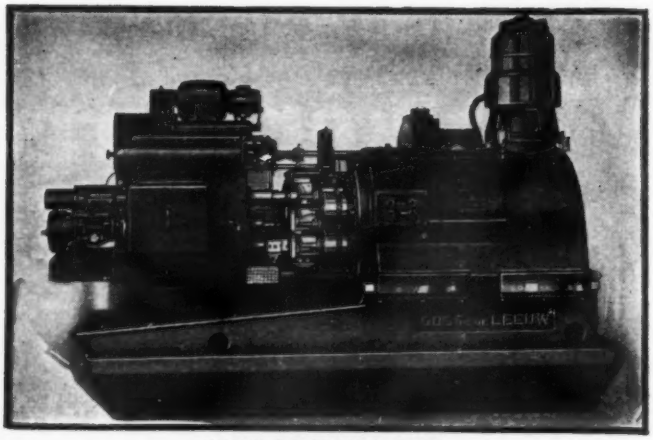
DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

GOSS & DE LEEUW
Multiple Spindle
CHUCKING MACHINES



TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions



WORK ROTATING TYPE

5 Spindles • 6 Spindles • 8 Spindles

Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

GREAVES No. 2
PLAIN or UNIVERSAL MILLING MACHINE
. . . for Speed, Accuracy, Production and Tool Room Work . . .

featuring:

- Power Feeds, all Directions
- Rapid Traverse—6-way
- Alloy Hardened Gears
- One Shot Lubrication to Table, Saddle Slides and Screws
- All Speed and Feed Changes through Positive Gearing
- All Speed and Feed Gearing run in Oil
- Timken Bearings
- Glass Sight Oil Control
- Unit Construction
- Central Control Position for all Operation Levers
- Coolant System

Specifications

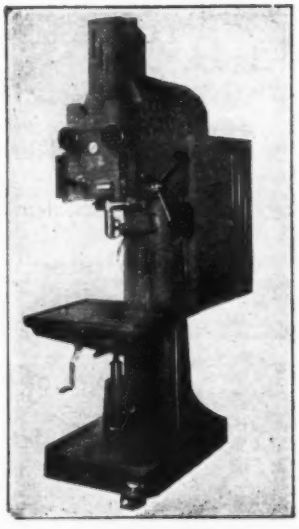
Table—52¼"x12"
Feed range—Longitudinal Power Feed 28"
Cross Power Feed 10"
Vertical Power Feed 19"
Overarm—4½" diameter
Spindle—Chrome nickel steel National Standard taper hole #50
Speeds—18—Range 20-1000 RPM Reverse on all speeds
Feeds—9—Range ½" to 18" per minute
Rapid traverse—Longitudinal—cross and vertical—All directions—75 per minute
Weight—3750 lbs.

Send for illustrated literature giving complete information. Write for nearest agent or dealer

Exclusive Distributors

H. LEACH MACHINERY CO.
387 CHARLES STREET PROVIDENCE, R. I.

Better TAPPING Faster
on a Model DB CLEVELAND Automatic Tapping Machine



Give your tap a chance to produce better threads. Our lead screw completely controls the thread accuracy through the entire tapping cycle, taking the load off the tap—Class 3, 4 and 5 gauge fits are therefore being produced on a production basis.

FIVE OUTSTANDING FEATURES

- **Lead Screw Controlled**
- **100 Per Cent Automatic**
- **Precision Depth Stop**
- **Sensitive Slip Clutch**
- **Split Second Reverse**

Full Descriptive bulletin available. Write for your copy today.

Also designers of Special Tapping equipment.

CLEVELAND
LEAD SCREW
TAPPING MACHINES

★

THE CLEVELAND TAPPING MACHINE CO.
3610 SUPERIOR AVE., CLEVELAND 14, OHIO

Now... YOUR CHOICE OF 3 PLAN-O-MILL MODELS

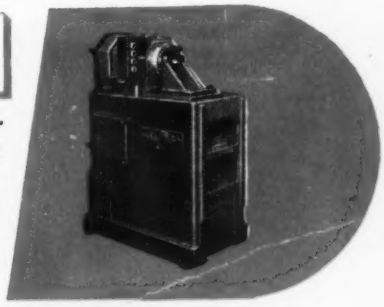
A PLAN-O-MILL FOR EVERY SIZE AND TYPE OF CYLINDRICAL FORM MILLING AND THREAD MILLING JOB . . . INTERNAL OR EXTERNAL

Save time, tools, materials and manpower with Plan-O-Mill. Whatever your form milling or thread milling job—internal or external—Plan-O-Mill does a precision job at a production rate.

Choice of 3 Sizes

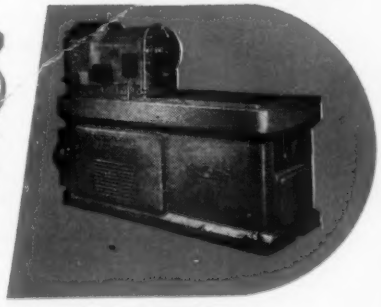
NUMBER 1

A compact machine requiring less than 9 square feet. Threads and mills up to 3" I. D. or O. D. Electronic feed and speed control. Control panel may be mounted on floor, wall, or ceiling.



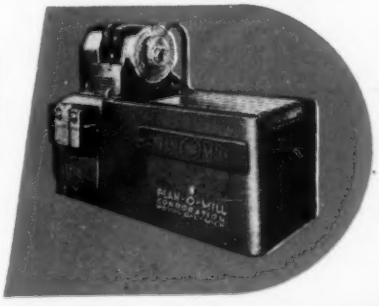
NUMBER 3

Threads and mills up to 8" I. D. or O. D. depending on amount of cut. Electronic feed and speed control with built-in control panel. Overall length: 75¼". Overall width: 37".



NUMBER 5

Threads and mills up to 20" I.D. or O.D. depending on amount of cut. Hydraulic feed and speed control. Overall length: 87". Overall width: 55¾".



PLAN-CO

MILLING CUTTERS

Years of on-the-job milling experience enable Plan-O-Mill engineers to design and make milling cutters of exceptional quality and performance. Available both in standard and special forms and sizes. Precision inspected with the most modern gaging equipment. For more parts per grind, more grinds per cutter, specify Plan-Co Cutters.

FREE DATA SHEETS FOR PRODUCTION PLANNING

As an aid to industrial executives in planning new or expanded production, Plan-O-Mill offers a set of three production planning data sheets. Each sheet contains scale plan views of a Plan-O-Mill machine (which may be cut out and positioned on your factory floor plan), together with complete specifications. A set is yours upon request.

THREAD AND FORM PLAN-O-MILL MILLING MACHINES

PLAN-O-MILL CORPORATION

1511 E. EIGHT MILE ROAD • HAZEL PARK, MICHIGAN

THREAD AND FORM PLAN-CO MILLING CUTTERS

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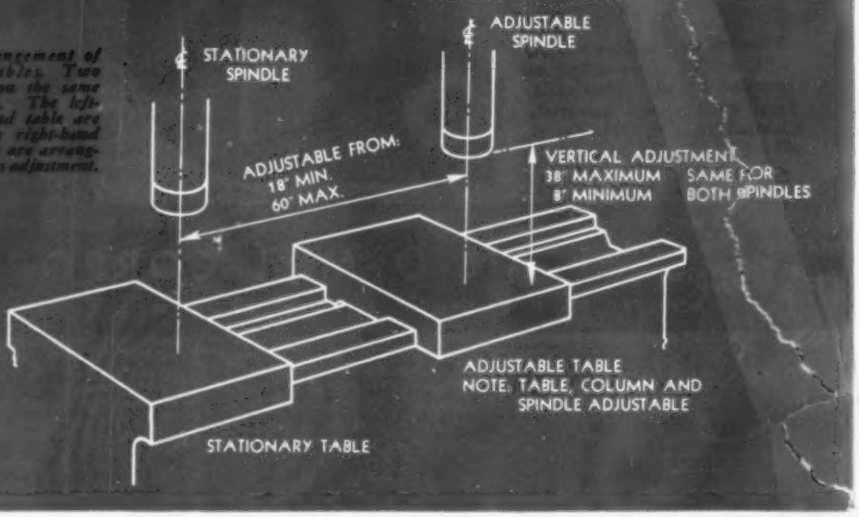
CRANK PIN AND WRIST

Boring Operations Cut

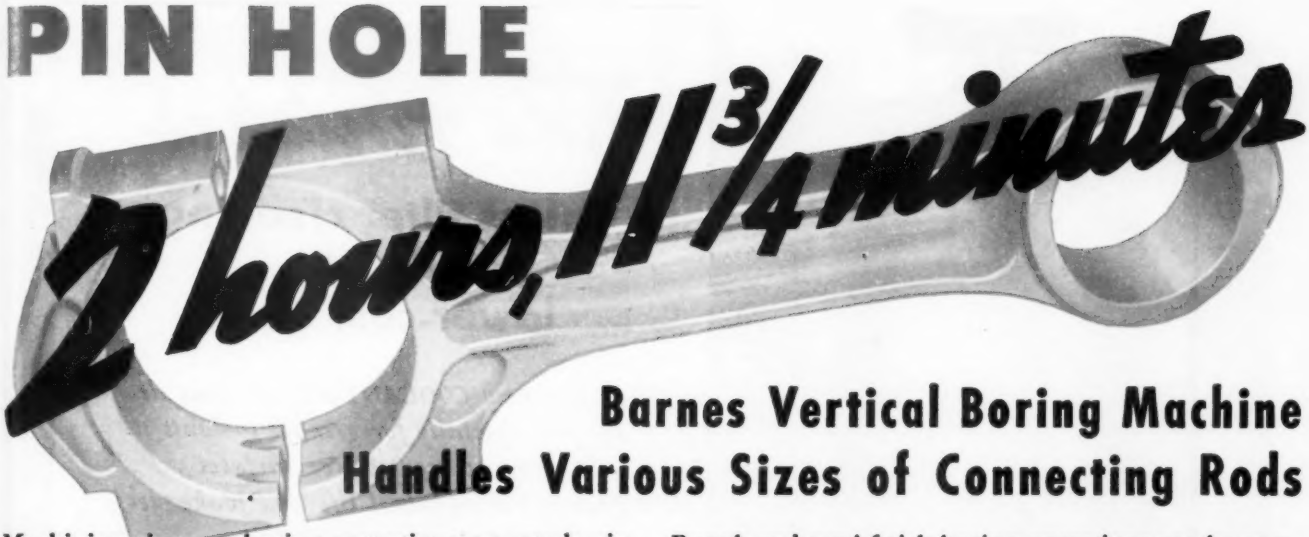
Schematic arrangement of spindles and tables. Two tables mounted on the same bed are utilized. The left-hand column, and table are stationary. The right-hand column and table are arranged for simultaneous adjustment.


STATIONARY SPINDLE
ADJUSTABLE SPINDLE
ADJUSTABLE FROM: 18" MIN. 60" MAX.
VERTICAL ADJUSTMENT 38" MAXIMUM 8" MINIMUM SAME FOR BOTH SPINDLES
ADJUSTABLE TABLE NOTE: TABLE, COLUMN AND SPINDLE ADJUSTABLE
STATIONARY TABLE

W. F. & JOHN BARNES

W. F. and JOHN BARNES COMPANY, ROCKFORD, ILL., *Special* MACHINE TOOLS

PIN HOLE



2 hours, 11¾ minutes

Barnes Vertical Boring Machine Handles Various Sizes of Connecting Rods

Machining time on boring operations on crank pin and wrist pin holes in connecting rods was cut from 204 minutes to 72¼ minutes with this W. F. and John Barnes 2-Column Vertical Boring Machine. The machine is designed to handle various sizes of connecting rods. Because of its automatic operating cycle, the operator can assemble the studs and caps onto other rods during machine operation

This job is another excellent example of special machine design for high production boring of connecting rods. The two hydraulically-actuated sliding heads on the Barnes machine may also be operated as two independent boring machines. The heads are driven by two-speed motors. Machine is provided with manual selection for fast feed, slow feed, and reverse feed. The two-speed motor and a manual shift for quick gear change give four spindle speeds. Pick-off gears give an additional range of speeds from 12 to 400 r.p.m.

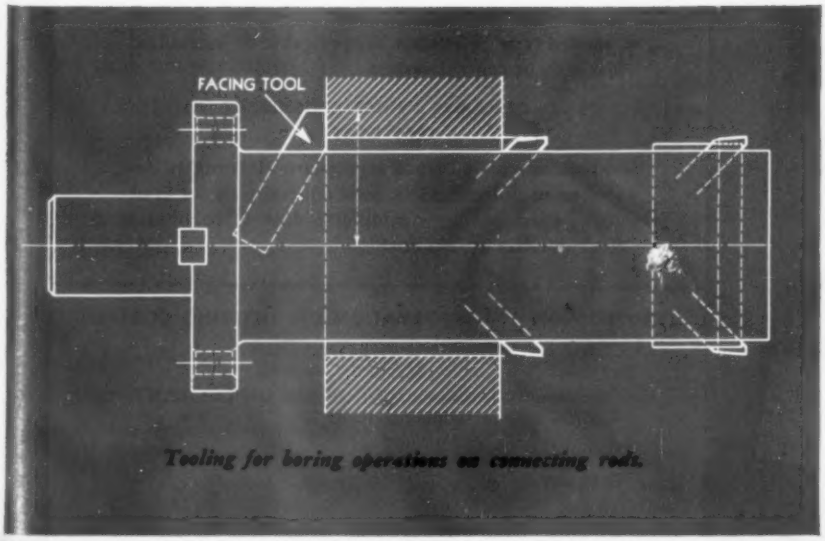
The left-hand column and table are stationary; while the right-hand column and table are arranged for simultaneous adjustment. Spindle centers are adjustable from 18″ minimum to 60″ maximum. The machine has a 30″ feed stroke and the distance from the fixture platen to the spindle nose is 8″ minimum — 38″ maximum. Spindles are of alloy steel, mounted in heavy duty anti-friction bearings.

Rough and semi-finish boring operations can be combined on one bar because of the long bearings on the spindles. The long saddles on the two hydraulic sliding heads makes it possible to adapt this machine for stub boring, with feed rates from ⅛″ to 7″ per minute. Controlled by pushbutton panel, the operator can select either manual or automatic machining cycle at will. Manual control permits fast feed, slow feed and reverse feed. Positive lubrication of the sliding heads and machine ways is also provided.

How to Get Special Machine Tools for Multiple Machining Operations

This manufacturer obtained this outstanding reduction in costs and machining time by submitting blueprints and production requirements to Barnes engineers who designed the Vertical Boring Machine to handle connecting rods of varying sizes and diameters. The machine can also be converted to other production boring jobs by making changes in tooling and work holding fixtures.

If you have similar boring jobs, or other multiple machining operations which include *drilling, boring, reaming, tapping, facing, milling* or *honing,* you can obtain the same design service and Barnes Special Machine Tools for your specific requirements by submitting drawings and production data to our engineers. There is no obligation.

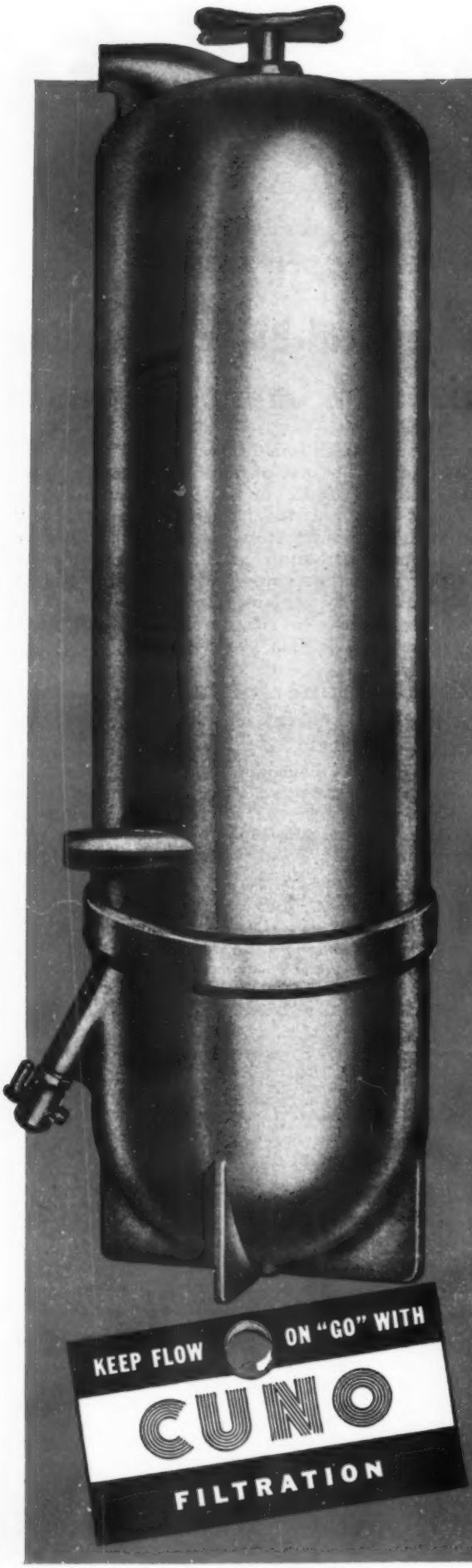


Tooling for boring operations on connecting rods.

Additional Data

on W. F. and John Barnes SPECIAL MACHINE TOOLS which includes Performance Data on actual metal working jobs in the field, will be sent to key production personnel on request. Barnes Performance Data may suggest a tooling or a production setup you can use today. The SPECIAL MACHINE TOOLS book (No. 1245) will be sent without cost.

FOR DRILLING, REAMING, TAPPING, BORING, FACING, MILLING AND HONING OPERATIONS



Fine Finishes

...less filter cleaning with this lower-cost filter

Cuno's new COOLANT-KLEAN was developed especially for grinder coolants to help produce scratch-free surfaces . . . greatly extend wheel life and make element replacement quick and easy.

Here's new assurance of better finishes — and savings in filter cost, maintenance and replacement, plus a bonus in longer coolant life.

Firms using Cuno's new COOLANT-KLEAN have expressed amazement at the greater amount of dirt collected . . . the infrequency of bag replacement . . . and the elimination of "pick-ups" on the work.

You can now obtain — with COOLANT-KLEAN — extremely fine finishes, even at the end of an up-to-6-weeks period without changing the bag. Coolant stays cleaner — needs changing less often. Less loading of the wheel, too.

LOWEST-COST FILTER

COOLANT-KLEAN meets specifications at lowest cost. It is priced less, to begin with, than most filters. Maintenance is less — fewer new bags, less time for replacement (under 5 minutes), lower cost of new element — than for any other comparable replacement-element filter.

NEW CONSTRUCTION PRINCIPLE

COOLANT-KLEAN handles full flow of coolant or cutting oil, yet requires less floor space than other, more expensive types. No filter aid needed. Eliminates precoating time. Gets away from "stuffed type" elements. Is applicable to individual machine or central system.

DESCRIBES "FINER FINISHES AT LESS COST"

This newest advance in coolant-cleaning is described in Bulletin 3110. Send coupon now for your copy. Find out how simple it now is to obtain finer finishes at less cost.

SEND COUPON FOR INFORMATION ON FILTERING COOLANT

CUNO ENGINEERING CORPORATION
242 South Vine Street, Meriden, Connecticut

Gentlemen: Rush information on your new COOLANT-KLEAN filter for grinder coolants.

Name .....

Company .....

Address .....

Please send representative ☐

WHAT HAS HAPPENED

IN THE WORLD OF LUBRICANTS?

Is your plant taking advantage of these new War-Proved Socony-Vacuum Developments to boost machine output and cut maintenance costs?

OUT OF THIS WAR has come a wealth of new lubrication knowledge and experience to increase your machine efficiency . . . and profits.

This message is to call your attention to new products, new methods and new techniques developed by Socony-Vacuum and now available for every plant in every industry.

Here are a few of the most significant new products added to the famous Gargoyle line:

New circulating oils and hydraulic fluids designed for precision machines operating at higher speeds, pressures and temperatures.

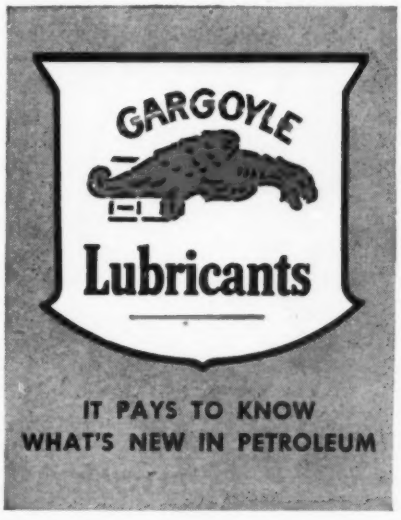
New turbine oils with extra oxidation and rust resistance added to a superior base stock.

New greases that are standing up under far higher temperatures and heavier loads than previous products.

New cutting fluids for new machines, and new metals—fluids that are lengthening tool life, providing more accurate finish and increasing production to new higher levels.

New rust preventives and heat-treating oils for greater protection against corrosion, and faster, more uniform quenching.

With these and other important new product developments, Socony-Vacuum has perfected a new 5-step program to make certain that the *right* oil goes in the *right* place, in the *right* way. This program gives you these extra benefits:



☛ Complete lubrication study of your plant with specific accurate recommendations for the correct lubricants needed for every machine.

☛ Skilled engineering counsel on difficult lubrication problems.

☛ Lubrication schedules and charts for each machine.

☛ New storage and handling systems to save floor space and manpower.

☛ Progress reports on benefits obtained.

You'll find it will pay you to investigate this program now—and put it to work in your plant.

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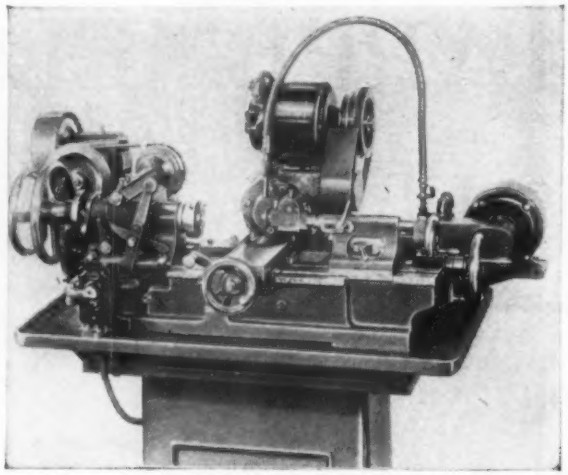
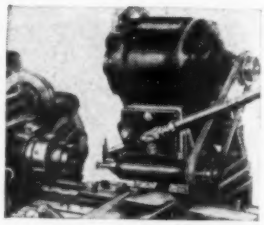


Fast, PRECISION THREADING *of* SMALL PARTS *Assured . . . by*

WALTHAM THREAD MILLERS

All standard forms of threads can be milled to closest precision on these fast, versatile, convenient machines. Waltham is in position to furnish the various cutters required.

Three motors are employed on WALTHAM machines, permitting individual speed changes for cutter and work and constant speed for pump. Available speeds are provided for cutting either brass or steel. A single start and stop station controls all motors.



Machine equipped with Internal Threading Attachment

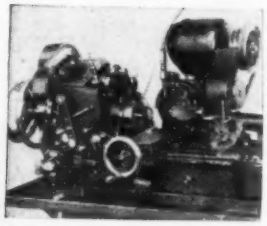
Specifications:

Swing over carriage—3"
Capacity—(dia. of work)—2" or smaller
Thread length (work on centers) —8¾"
Thread length (work chuck-held) —10"
Dia. hole through spring chuck—⅝"
Dia. hole through work spindle—¾"
Max. distance between centers—12"
Floor space—48" x 34"

Write for Bulletin 244A

EXTRA EQUIPMENT

Special equipment, extending the utility of WALTHAM THREAD MILLERS, includes attachment for relieving, taper, internal threading, multiple cutter threading, translating gears, metric lead screw, cam operation, special tailstock for multiple cutter work.



Machine equipped with Relieving Head

WALTHAM
TRADE MARK REGISTERED U.S. PAT. OFF.

WALTHAM
MACHINE WORKS,
WALTHAM, MASS.

No. 101 "PRODUCTION"

Centerless Feed POLISHING MACHINE

. . . for any grade finish at lowest cost

This sturdy machine for polishing and buffing cylindrical work assures any grade of finish at the fastest feeds and at lowest costs. Quick adjustment is provided for wheels from 10 to 16" diameter. A suitable truing device makes truing of wheels possible while in motion. A patented centerless feed provides for speed variation as desired. All parts are accessible; work support is adjustable with feed unit.

Send for illustrated literature giving complete details.

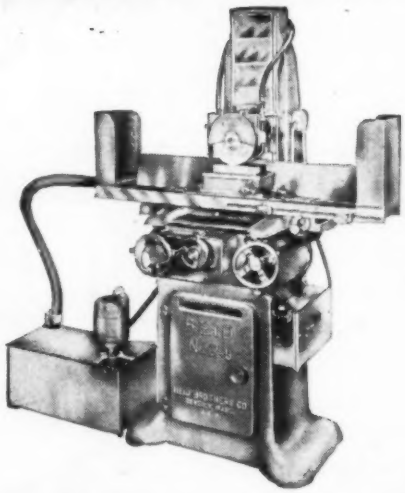
PRODUCTION MACHINE CO.

Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.

GREENFIELD, MASS., U. S. A.

REID *Precision*

SURFACE GRINDER



EQUIPPED FOR WET GRINDING

MAINTAINED ACCURACY WITH ECONOMY.

SEND FOR CATALOG AND PRICE LIST TODAY.

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BEVERLY · MASSACHUSETTS

L-W Magnetic Chucks

● Guaranteed maximum holding power, constructed for long life, water-proof for wet or dry grinding. These plus-features combine with scientific design and highest grade materials to offer positive assurance that L-W Magnetic Chucks will meet all requirements and conditions. L-W supplies Magnetic Chucks in four sizes, equipped with connections to operate on either 110 or 220 volt D.C.

Size 5¾" x 13"	$ 47.65
Size 6½" x 18"	63.15
Size 8" x 24"	109.30
Size 10¾" x 37"	202.50

DEMAGNETIZERS

Model B-2 working surface 7¾" x 12½" x 6¾"....$63.20

Model J-1 working surface 7¼" x 7¼" x 6¾".....$41.15

RECTIFIERS

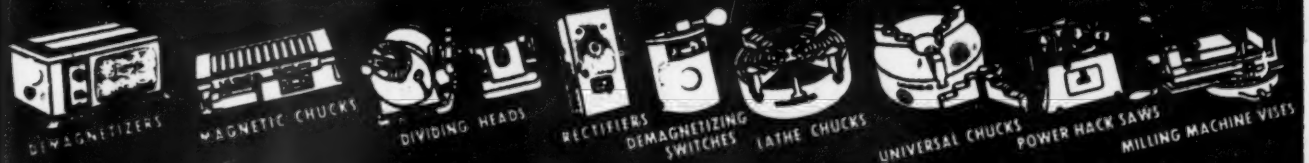
Converts A.C. into D.C. A.C. input 110 volts. D.C. output 110 volts, 8 amps. Suitable for use with our 5¾" x 13" and 6½" x 18" magnetic chucks. Price $38.75. Larger capacity rectifiers available.

DEMAGNETIZING SWITCHES

Field discharge type $16.25

L-W Demagnetizing Switch $8.90

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products



L-W CHUCK COMPANY 5 N. ST. CLAIR ST. TOLEDO 4, OHIO

TWENTY SOLUTIONS
for thousands of difficult grinding problems

Sterling's Stermounts—Mounted Wheels and Points—are supplied with removable spindles for quick grinding of inside surfaces and other out-of-the-way recesses. There is a size and shape for almost any application . . . many more types than the twenty shown above.

There are literally thousands of uses for Stermounts . . . you can think of many in your own department or plant. For sharpening, grinding, roughing and finishing small parts and inside areas, they are ideal.

Their range of usefulness is increased by the fact that they are available in either vitrified or resinoid bonds. You'll like the detachable spindles which permit you to reorder only the wheel or point needed . . you use the spindles over and over again.

Sterling Stermounts are economical, easily used and efficient. Your letter will bring full information at no obligation.

The complete line of Sterling's Stermounts is shown in this new folder. Full description and prices . . . write for it!

Your Best Industrial Supply Distributor Carries Sterling Wheels In Stock

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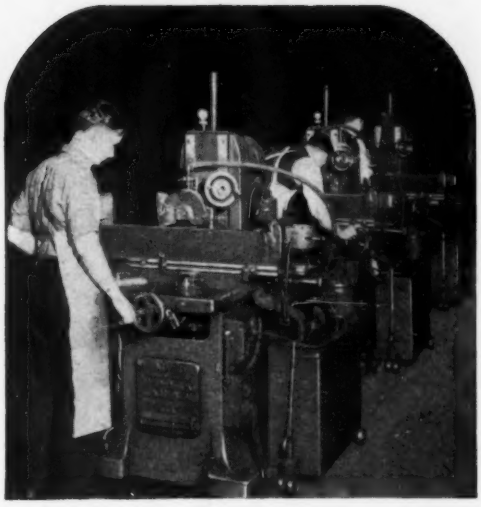
THE STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

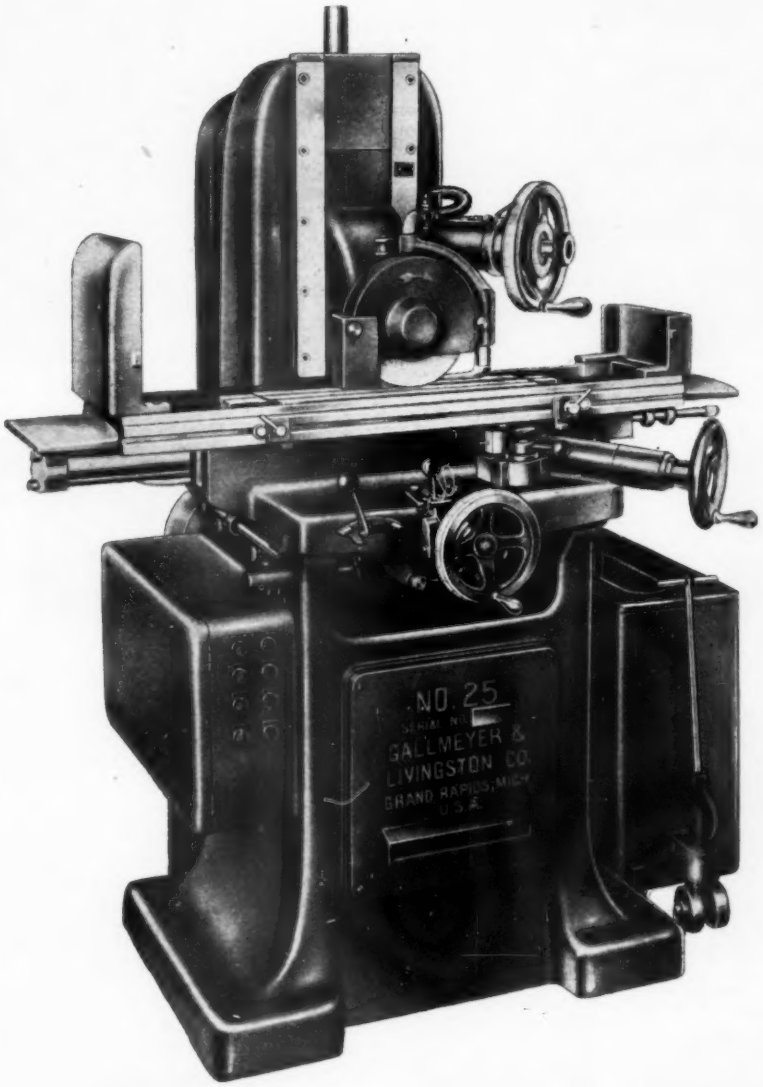
THE WHEELS OF INDUSTRY

PRECISION-PRODUCTION

SPEEDS PEACE TIME MANUFACTURING

At right, a battery of GRAND RAPIDS Precision Tool Room type Surface Grinders on production runs in one of America's foremost typewriter and business machine plants.





No. 25—Capacity 6"x10"x18" Table speeds up to 80 f.p.m.

GRAND RAPIDS Grinders are ready now to help you cut rising production costs.

Rugged one piece column and base casting guarantees permanent alignment for the life of the machine.

All electrical controls mounted in dust tight, easy to service, cabinet.

Pre-loaded ball bearing spindle built for extreme accuracy and long life.

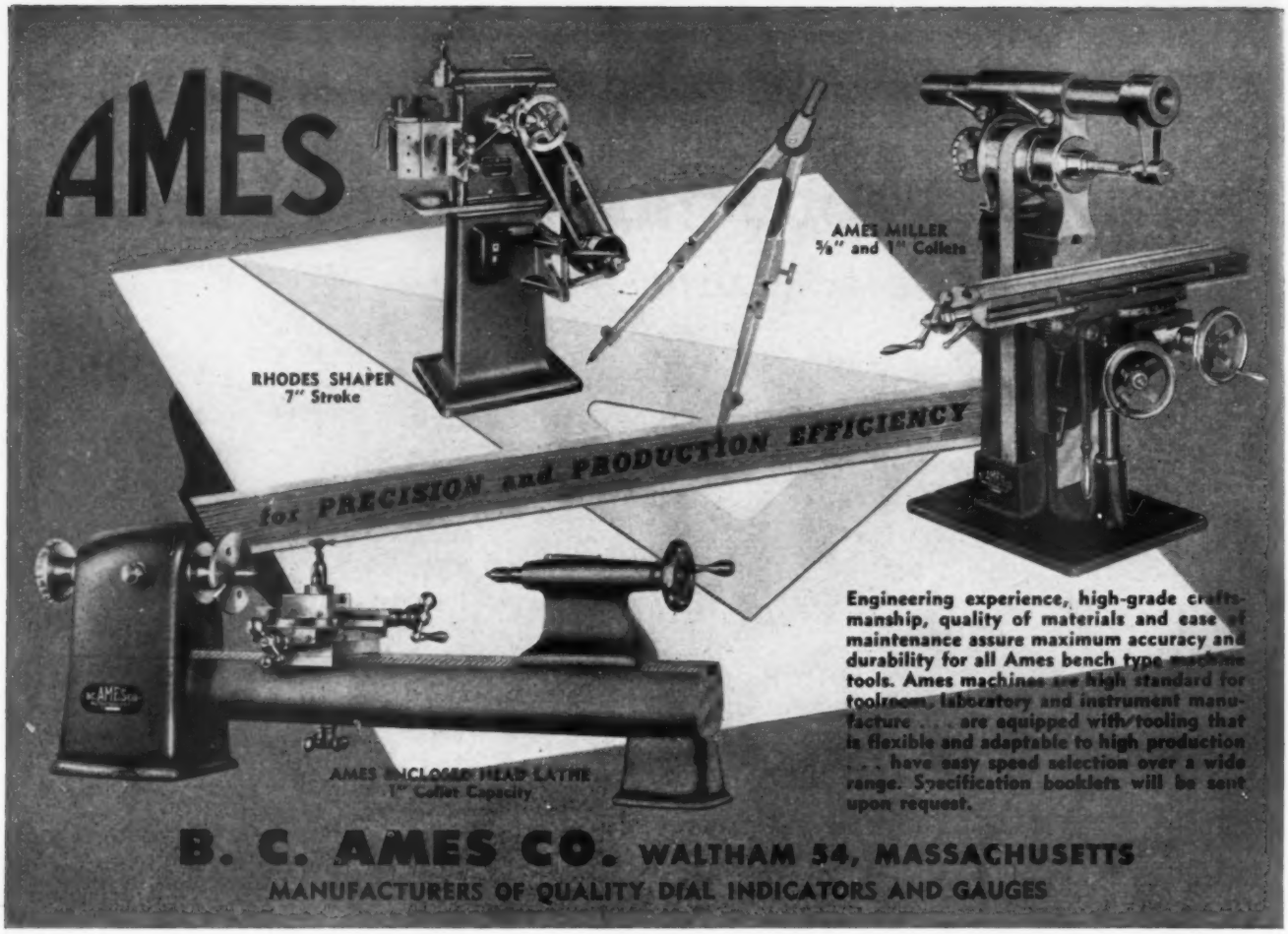
One-shot lubricating system, no oilers to forget.

Vane type Hydraulic Pump, for fast, smooth, operation.

Write today for Bulletin GL-101

GALLMEYER & LIVINGSTON CO.
330 STRAIGHT AVE. S.W.
GRAND RAPIDS, 4 MICHIGAN

AMEs



Engineering experience, high-grade craftsmanship, quality of materials and ease of maintenance assure maximum accuracy and durability for all Ames bench type machine tools. Ames machines are high standard for toolroom, laboratory and instrument manufacture . . . are equipped with tooling that is flexible and adaptable to high production . . . have easy speed selection over a wide range. Specification booklets will be sent upon request.

B. C. AMES CO. WALTHAM 54, MASSACHUSETTS

MANUFACTURERS OF QUALITY DIAL INDICATORS AND GAUGES

The SUPER METHOD

of TRIMMING FORMED PARTS

and performing a host of other metal cutting jobs!

The negligible down-drag and the ability of Tannewitz High Speed Band Saws to cut sheet metal from 90° to near 0 or 135° at tremendous speed make these machines ideal for trimming. Cuts can be made with perfect safety without using a rest of any kind. Friction sawing with Tannewitz High Speed Band Saws also results in perfectly amazing time savings in the cutting of flat sheets, soft or hardened steels, armor plate, plastics, glass and many other materials. Whatever your cutting problem, chances are it can be done better and faster with Tannewitz Band Saws. Investigate this "Super" method of cutting.

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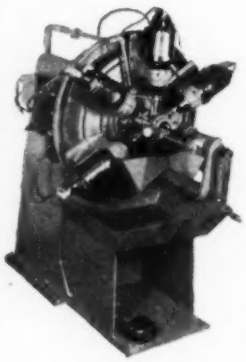
FRICTION SAWING *with* **Tannewitz**

HIGH SPEED BAND SAWS

THE TANNEWITZ WORKS GRAND RAPIDS 4, MICHIGAN

Faster MULTIPLE DRILLING!



Set-up with six drilling units (two at rear) for drilling seven holes of four sizes in magnesium at rate of seven pieces per minute.

The higher rate of feed that is possible with the Govro-Nelson Drilling Unit because of its centrifugal feed principle results in much faster drilling.

By automatically regulating the feed of the drill to protect it against breakage when encountering hard spots in the material, it permits a rate of feed considerably higher than with fixed feed mechanisms.

Designed for drilling up to 3/8", depending upon the material. Can be mounted at any angle or in any plane.

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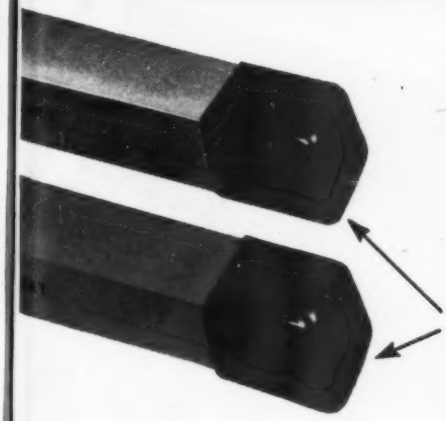
Automatic **DRILLING UNIT**

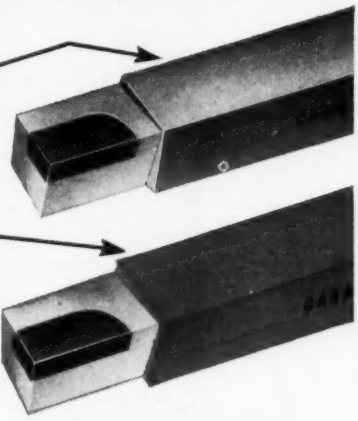
CARMET
Carbide Tools and Tips



★ **Blue Shanks for Iron and Non-Ferrous Metals**

★ **Red Shanks for Steel Cutting.**

★ **Wax Caps Protect Tips in Stock and Transit**



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Carmet sintered carbide tool bits are packed for shipment in strong, metal-reinforced boxes of distinctive design. The grade, size and number of pieces are marked on each end of the box, for convenience on your stock shelves.

EASY TO IDENTIFY

In addition to the box marking, and to the shank coloration (see above), each Carmet tool bit is stamped with the name and grade number . . . your stock clerks and machine operators can't mistake them.

All the Data on **CARMET**

Send for your copy

The 16-page Carmet Catalog contains full data on types, grades, sizes and applications of standard blanks and tools; information on special sizes, tool shank steel, etc. Write for it today.

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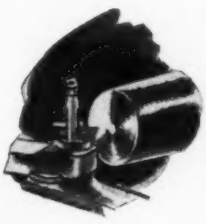

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Carmet carbide tips are produced by advanced techniques, under conditions of rigid control that maintain complete uniformity to type and grade. These carbide tools can show you tremendous increases in cutting speeds, and corresponding improvements in your finishing costs. ● Let our Service Engineers work with you to fit Carmet tools into your operations.

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STEEL CORPORATION · General Offices, Brackenridge, Pa.

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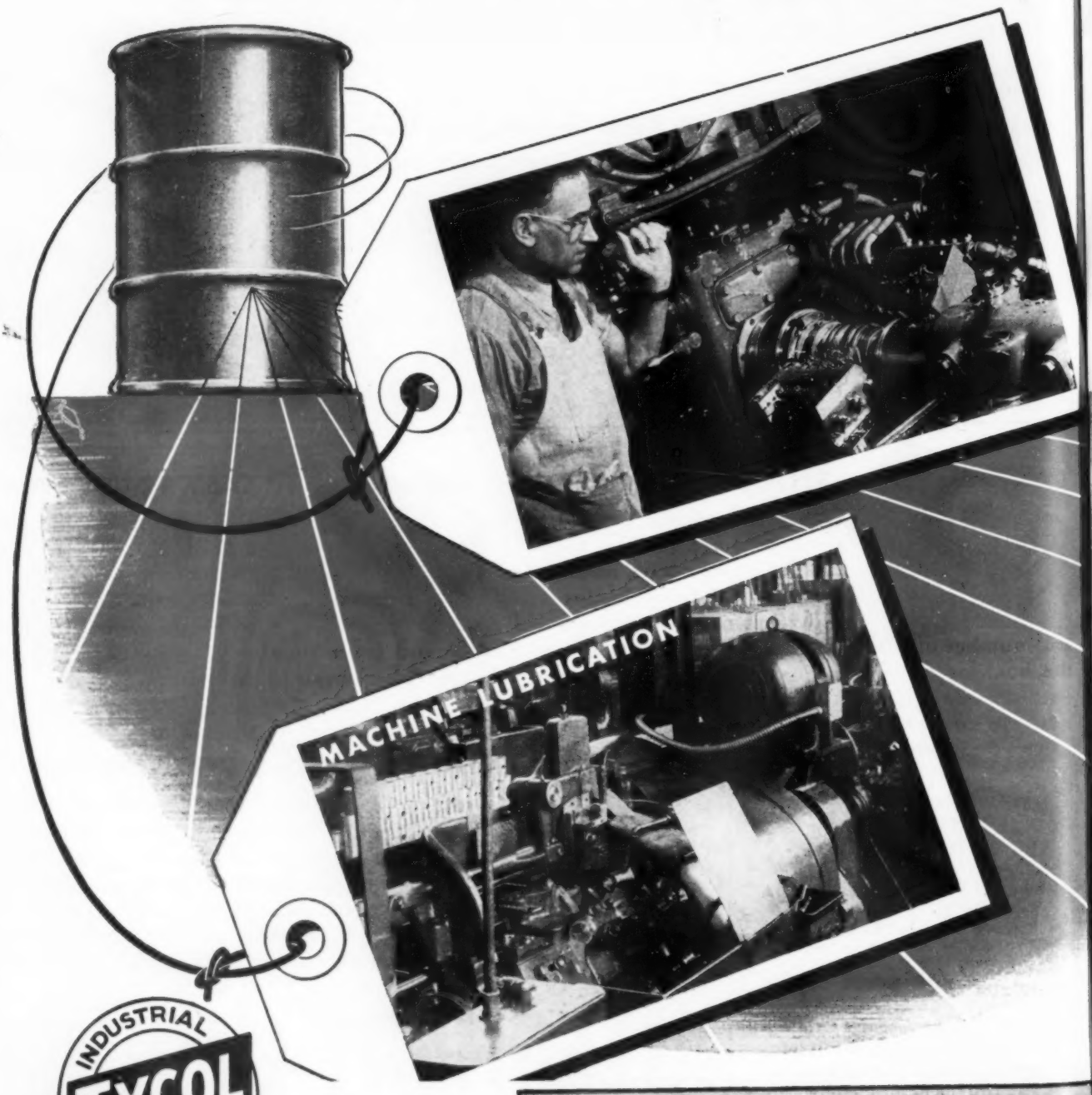

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FREER CUTTING, LONGER TOOL LIFE

By minimizing build-up on cutting tools, Tycol "Dual Purpose" permits faster cutting — lengthens tool life between grinds.

PROTECTS BEARINGS AND GEARS

Won't corrode, or harmfully affect copper or copper alloy machine parts. Result — lower maintenance costs.

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Tycol "Dual Purpose" brings out the best cutting performance of carbide tools, without attacking the binder.

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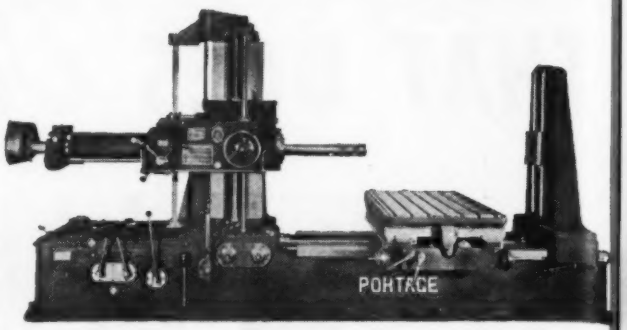

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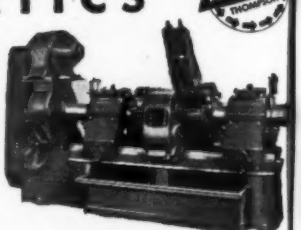

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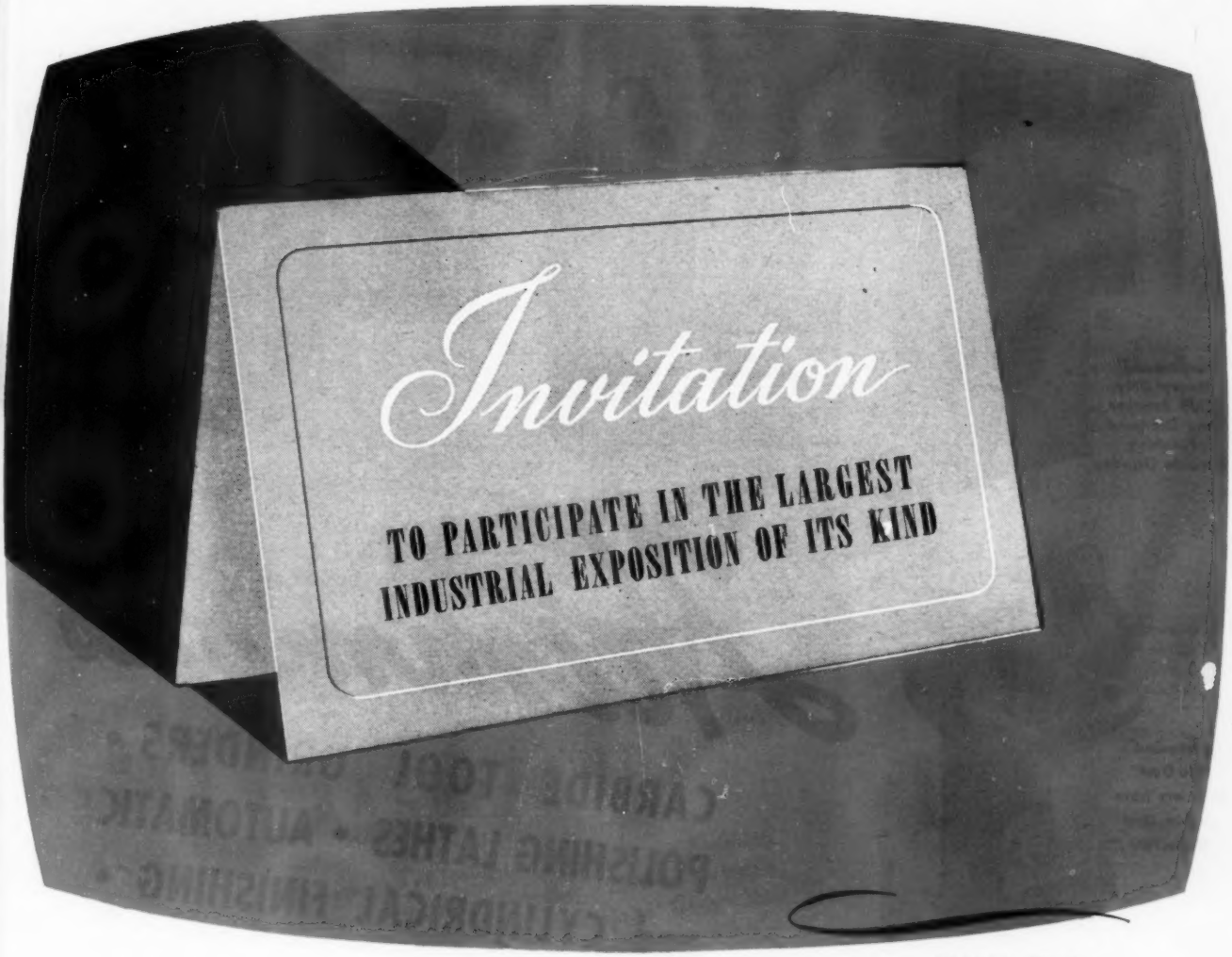

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WHY To Exhibit *New Era* Production Equipment and Processes

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Exposition Committee

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6" Roughing and Finishing Carbide Tool Grinder

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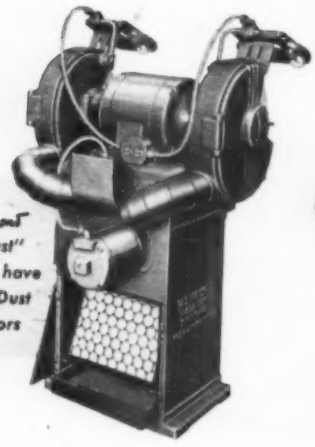

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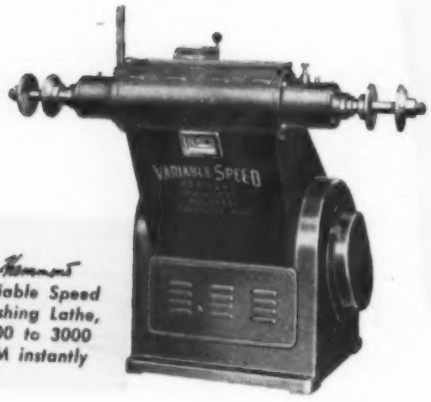

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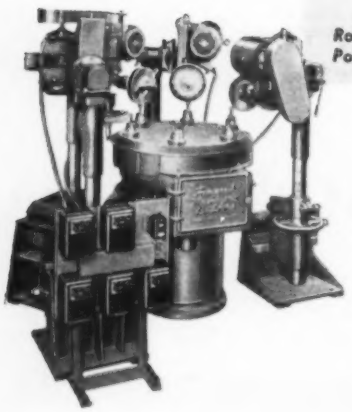

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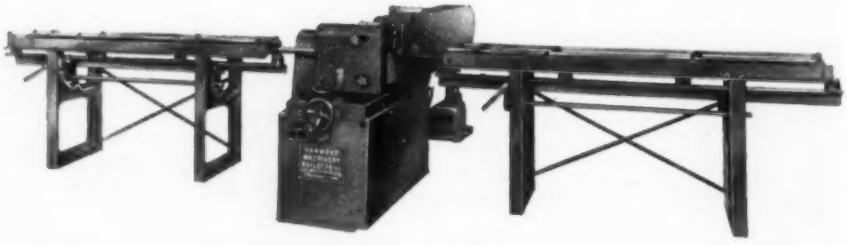

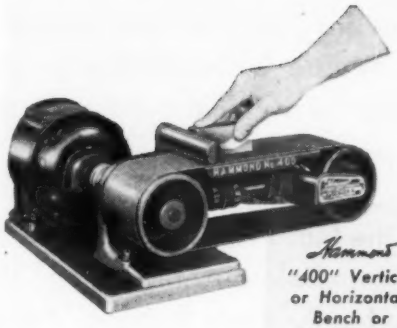

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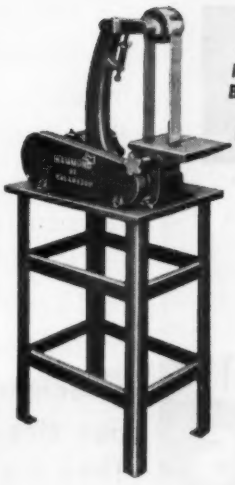

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Hammond No. 5 Grinder-Polisher Combination Bench or Floor Type for wheels or abrasive belts

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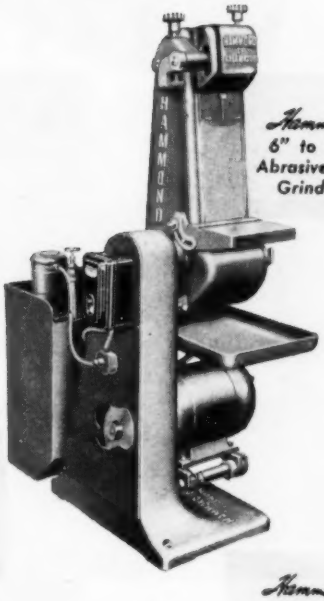
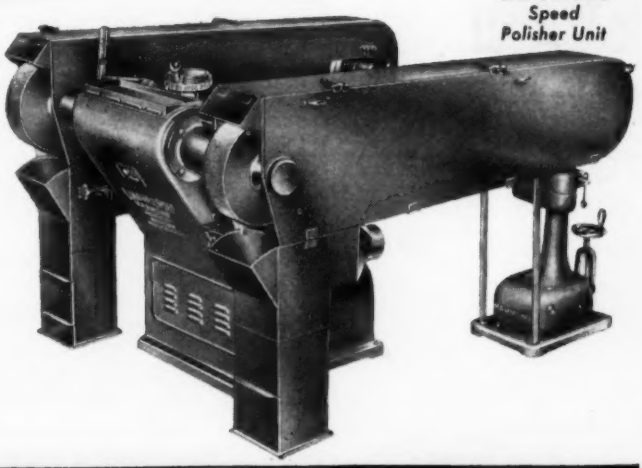
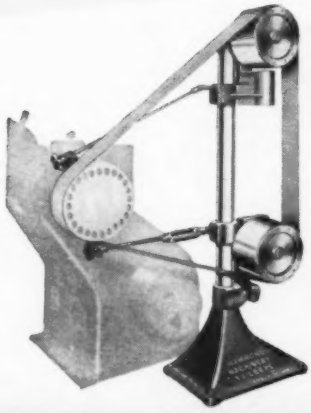


Hammond 6" to 10" Abrasive Belt Grinders

Hammond No. 3 BACKSTAND and Variable Speed Polisher Unit





Hammond No. 4 BACKSTAND For use with abrasive belts

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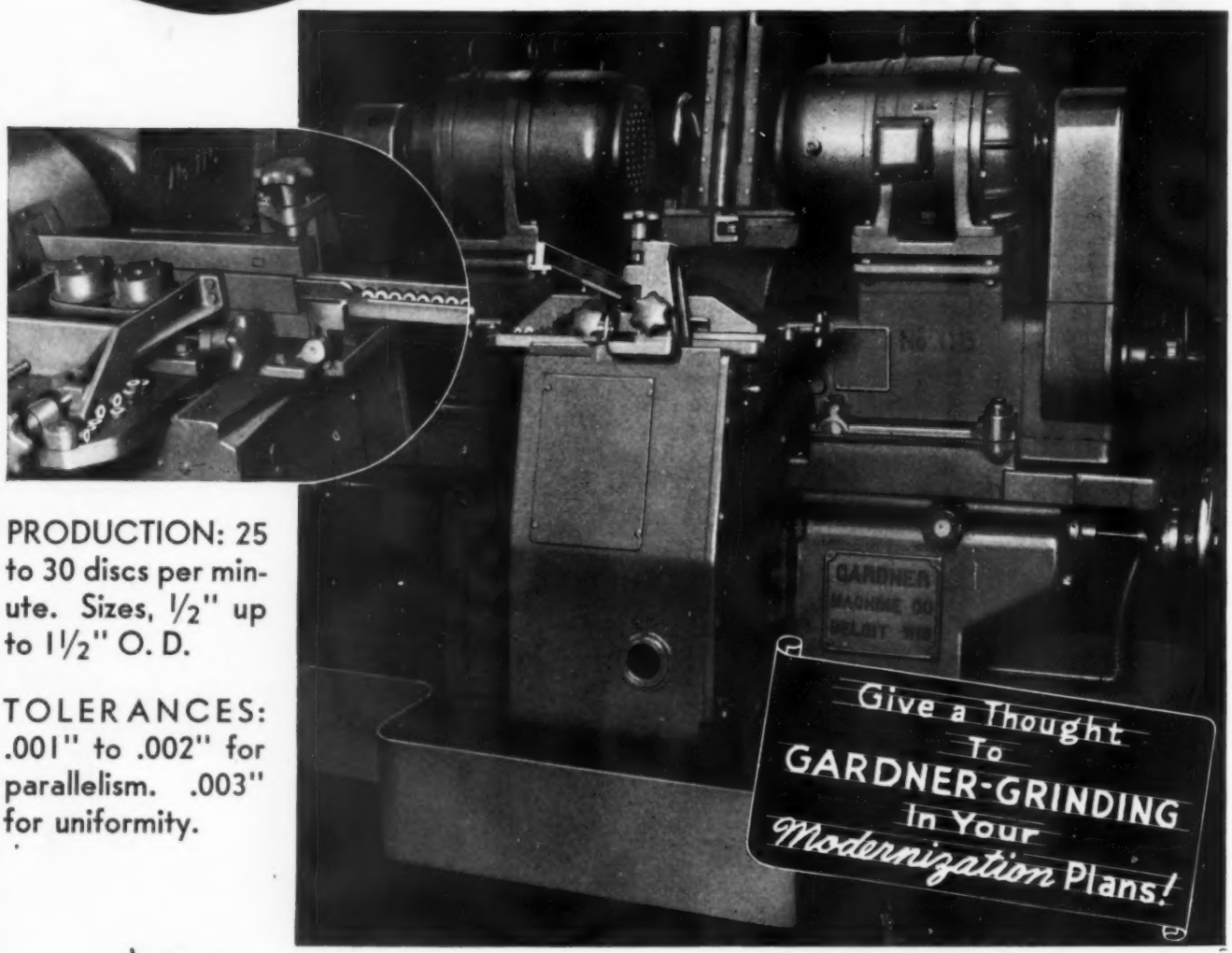

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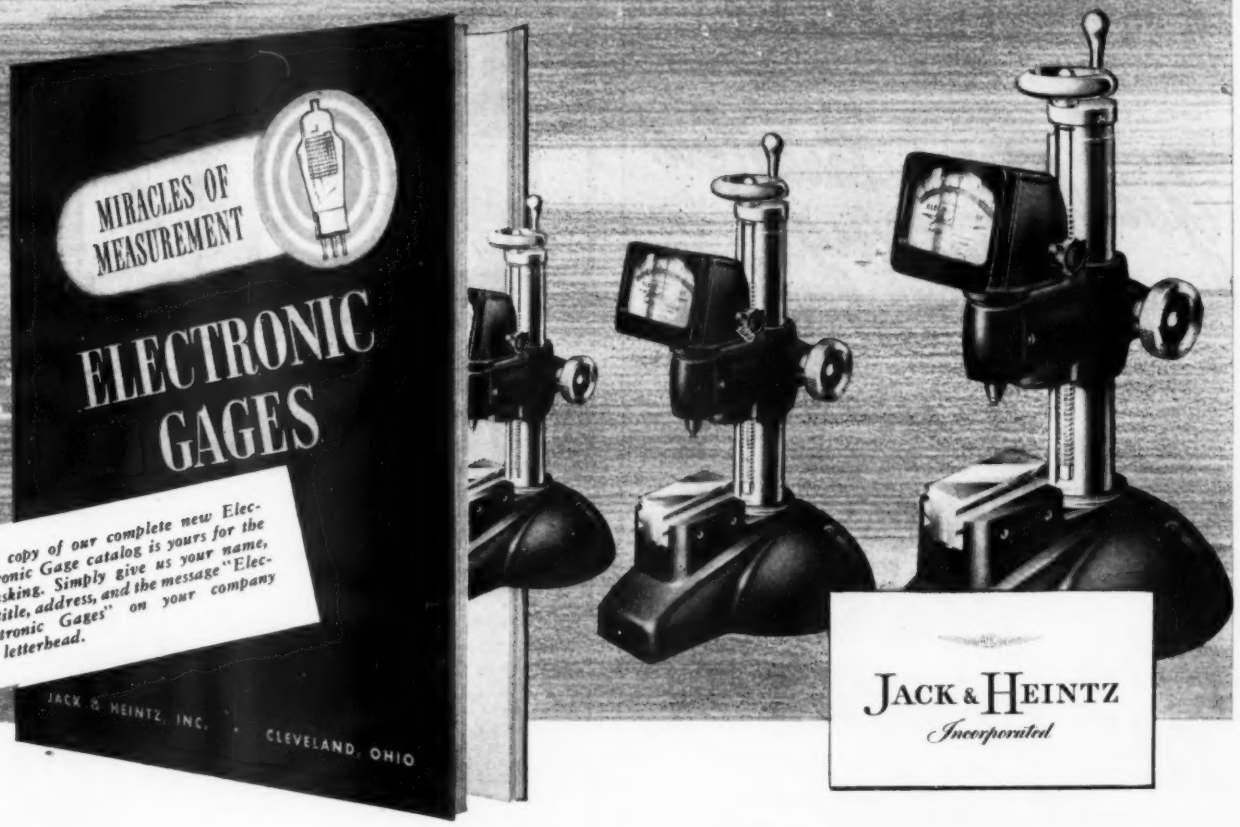
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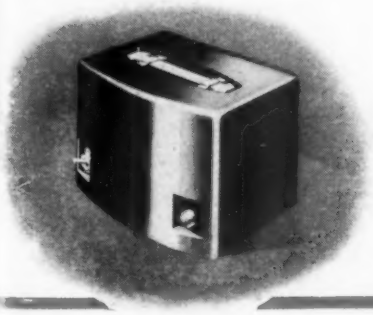

In addition to the electronic external comparator shown, this gaging principle is now available in height gages, internal comparators, surface indicators, and automatic bearing ball separators. Each gage has only a single moving part—without complicated mechanical linkages to wear and affect accuracy—and is adaptable to an infinite variety of work.

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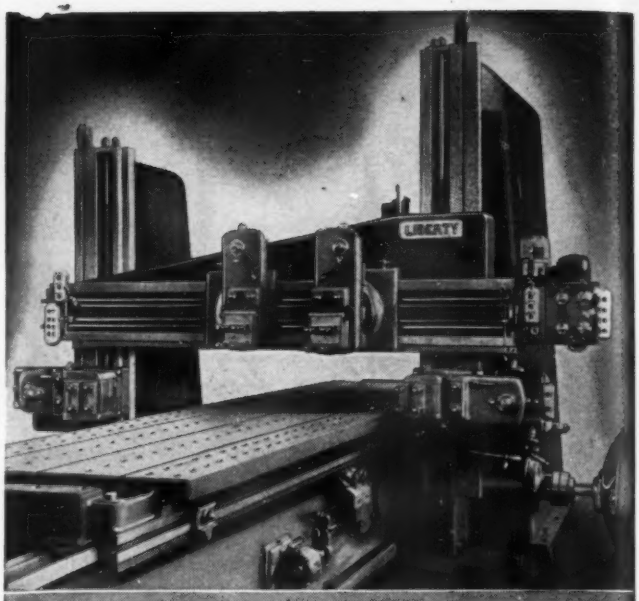

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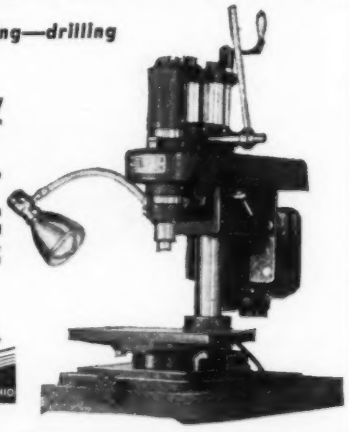

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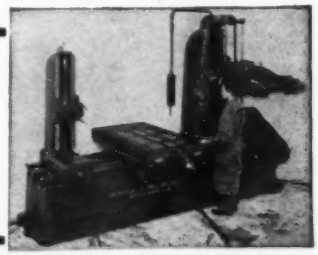

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Correct Lubrication By Socony-Vacuum Assures More Continuous Operation For Peacetime Production . . .

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Correct Lubrication Vital

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Today, all of this additional knowledge . . . all of these new products . . . are yours for the asking . . . in *Socony Vacuum's Correct Lubrication* for your plant.

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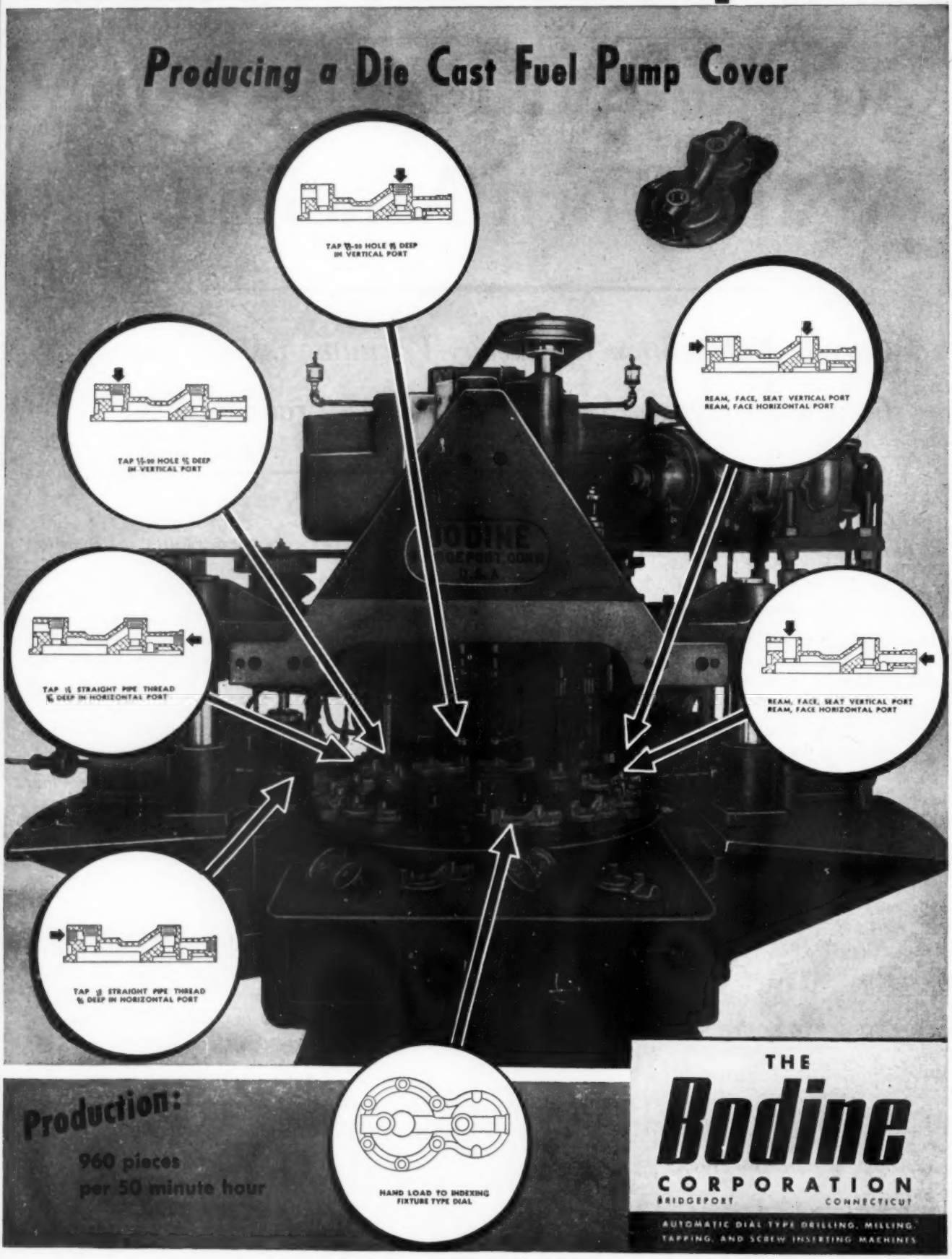
Bodine...Case History No. 14

Producing a Die Cast Fuel Pump Cover


TAP ⅜-00 HOLE ⅝ DEEP IN VERTICAL PORT
TAP ⅜-00 HOLE ⅝ DEEP IN VERTICAL PORT
REAM, FACE, SEAT VERTICAL PORT
REAM, FACE HORIZONTAL PORT
TAP ¼ STRAIGHT PIPE THREAD ⅝ DEEP IN HORIZONTAL PORT
REAM, FACE, SEAT VERTICAL PORT
REAM, FACE HORIZONTAL PORT
TAP ¼ STRAIGHT PIPE THREAD ⅝ DEEP IN HORIZONTAL PORT
HAND LOAD TO INDEXING FIXTURE TYPE DIAL

Production:

960 pieces
per 50 minute hour

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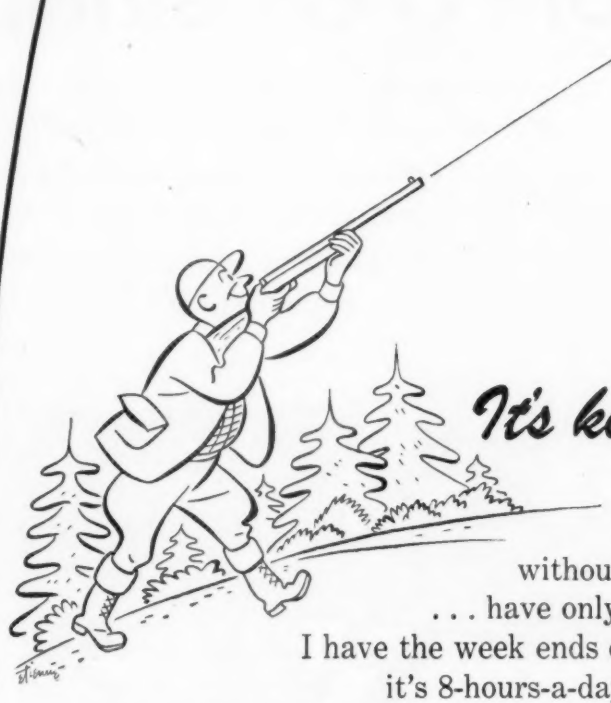
AUTOMATIC DIAL TYPE DRILLING, MILLING, TAPPING, AND SCREW INSERTING MACHINES



It's kind'a like my pet gun

Feels just right . . . can lug it all day without getting tired . . . can draw a bead quick . . . have only myself to blame for the birds I miss . . . I have the week ends off for gunning, and the rest of the week it's 8-hours-a-day at my Hendey Lathe. Give me gunning any day, but on Monday mornings it's nice to know the Hendey has plenty of good points like my pet gun.

The controls are so handy that even the green operators get the "feel" quickly . . . I can do more than a lot of fellows on other kinds of lathes without getting tired . . . I have only myself to blame for spoiled work, because the Hendey Lathe is so accurate and, at the same time, so flexible.

If you don't know all the fine points like I do, then it will pay to write Hendey — they'll send you complete information.

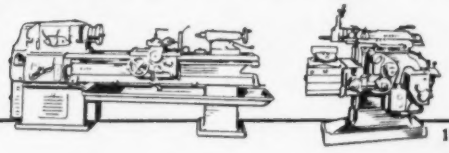
The Hendey Machine Company

Hendey

Main Office and Plant **— Torrington, Connecticut**

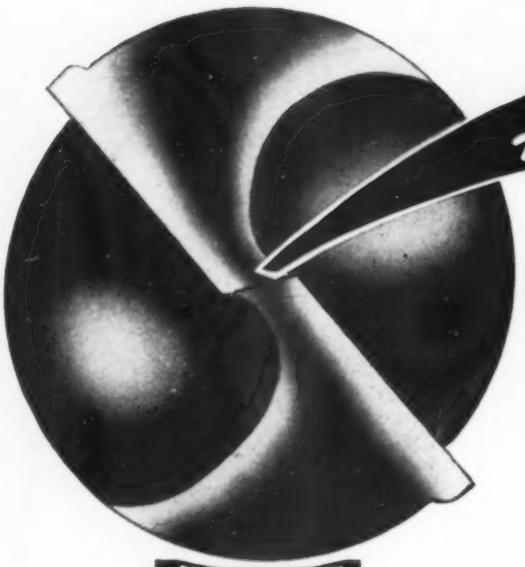
Branch Offices **— New York, Chicago, Boston, Detroit, and Rochester**

Representatives in **— Phila., Cleveland, Los Angeles, Pittsburgh, San Francisco**



TOOL ROOM LATHES
12" - 16" - 18"

SHAPERS
12" - 16" - 20" - 24" - 28"



Here is the Point!

FOR MORE HOLES FROM EACH GRIND

To get maximum production from drills, they must be sharp, correctly ground at the point. Oliver Drill-pointer Sharpened Drills give balanced cut with each lip doing parallel work, giving longer life to both drills and drilling equipment — more holes from each grind means greater savings in equipment.

Oliver's 510 Drillpointer . . .

Provides a point that gives greater clearance with less chisel point angle — thrust is reduced and uniformity maintained. Each drill point is precisely the same as every other drill point for multiple spindle drilling.

OLIVER INSTRUMENT CO.

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Don't Neglect Your Toolroom It's the Backbone of Production!

SEND FOR ILLUSTRATED CATALOGUE

Oliver OF ADRIAN

AUTOMATIC DRILL GRINDERS—TOOL AND CUTTER GRINDERS—DRILL POINT THINNERS—TEMPLATE TOOL GRINDERS—FACE MILL GRINDERS—DIEMAKING MACHINES

SAYS THE MAN IN THE HELMET—
"My first choice for any welding job is one of these swell
AIRCO ELECTRODES.
They're easy to use and they do a grand job."
AIRCO
ELECTRODES

THAT in brief is the reason why so many welders prefer Airco Electrodes for every welding job. For, in addition to meeting the metallurgical and mechanical requirements of each specific job, Airco Electrodes have those easy-working features that enable the welding operator to meet output schedules consistently.

After exacting laboratory trials each new Airco electrode is thoroughly pretested for working ease and efficiency by welding operators of varying skill and experience. Their suggestions, incorporated into the final product, assure an electrode that will rate high with the vast majority of operators.

* * *

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—which gives detailed information on Airco's complete line of shielded arc electrodes for every welding job. Address your local Airco office or Dept. A.M., Air Reduction, General Offices: 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Co., General Offices: Houston 1, Texas.

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OFFICES IN PRINCIPAL CITIES

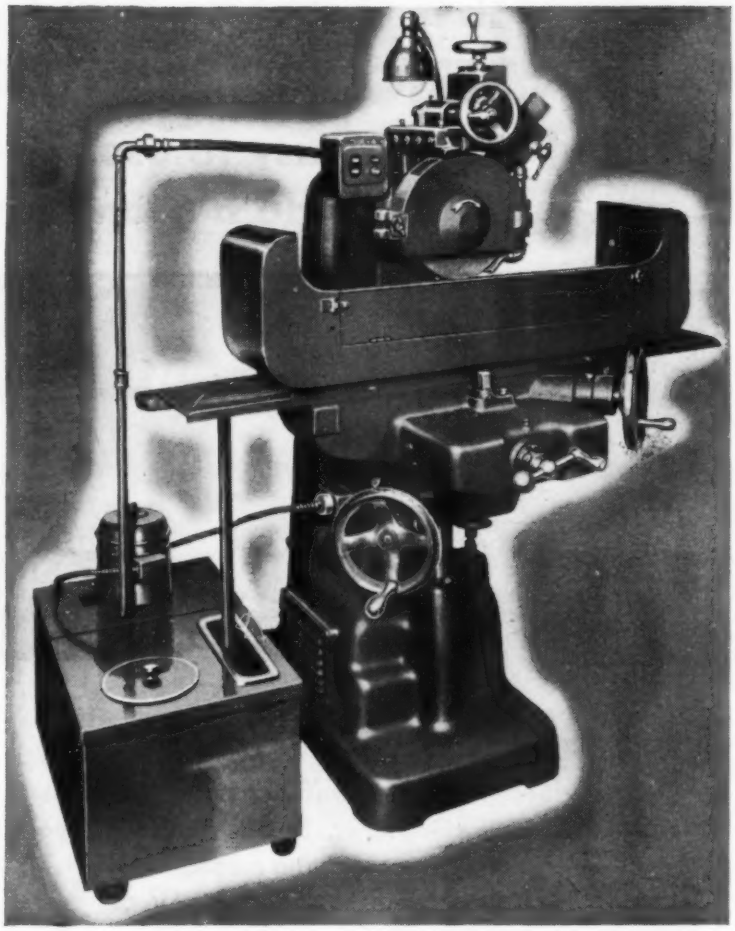
Weld with

AIRCO **ELECTRODES** FOR BETTER WELDS AND EASIER WELDING

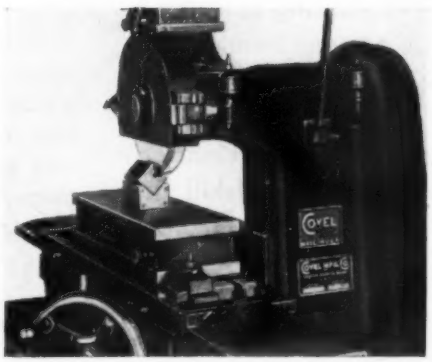
COVEL No. 15 SURFACE GRINDER
Is A Versatile Time Saver!

On short production runs . . . multiple toolroom jobs . . . the COVEL No. 15 with its quick set-up feature and operating flexibility will save extra production hours for you every month. For accurate grinding of odd sized pieces in small quantities, it can't be beat because:

- ★ **There are no dogs or feeds to change.**
- ★ **All controls are in front—for clear vision.**
- ★ **Operator drives table feed to fit finish.**
- ★ **Holds to close tolerances.**
- ★ **Rugged COVEL Spindle is completely dust protected.**
- ★ **Is adaptable for wet or dry grinding.**



Typical COVEL No. 15 Hand-Feed Surface Grinder set-up (Right) grinding V-blocks in toolroom. Table is 6" x 18"; transverse travel 7½", vertical travel 11". Portable, roller mounted unit for wet grinding comes complete with motor, splash guards and pump—adds materially to versatility of grinder.



See Your Nearest COVEL Dealer or Write for BULLETIN A-265

GRINDING MACHINERY SINCE 1874

COVEL INDUSTRIAL GRINDERS

COVEL MFG. CO., BENTON HARBOR, MICHIGAN U. S. A.

IT TAKES ALL 3

– for complete Tool and Die Steel Service

1 Outstanding Mill Quality

2 Strategically Located Warehouses { DETROIT, CHICAGO, TOLEDO, CLEVELAND, PHILADELPHIA, LATROBE, HARTFORD

3 Dependable Metallurgical Service { Latrobe service men are always glad to render personal counsel on your particular problems.

LATROBE

LESCO

- **High Speed Steels**
- **Die Steels**
- **Tool Steels**
- **Stainless**
- **Red Arrow**
  Cast Alloy for Metal-Cutting Tools.
  Welding Rod for Hard Facing.

S-6

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES and PLANT •• LATROBE • PENNSYLVANIA.

A New Precision Holder for Better Reaming

Here is a reamer holder designed and built by reamer specialists, with the one basic idea of bringing to your turret lathes, hand and automatic screw machines, the full precision qualities inherent in L & I Ground Flute Reamers.

The L & I Precision Centering Reamer Holder employs a new design principle. It quickly establishes a new center absolutely true with the spindle axis, and drives the reamer from this dead center. *Reamer does not float* — but follows true centerline free from weight or pressure. No bushings — no bell-mouthing — no tapered holes — corrects diagonal errors in turrets with worn locks.

Standard model holds reamers from 1/16" to 7/16" diameter interchangeably. Larger model for reamers 7/16" to 1⅛" diameter.

Write for bulletin giving full specifications and prices.

LAVALLEE & IDE, INC. • CHICOPEE, MASS.

L&I GROUND FLUTE REAMERS

AMIC VERNIER CALIPERS

QUICK-ACTION CALIPER FOR USE IN WORKSHOP — INSPECTION AUTOMOTIVE REPAIR

Permits accurate measurements of external and internal dimensions. Knife-edged jaws accommodate thread measurements and a depth gage blade, depth measurements. Made in stainless steel or toolsteel. Each caliper packed in a leatherette cover.
AMIC PRECISION VERNIER CALIPERS: 6", 10", 24"
AMIC PRECISION VERNIER HEIGHT GAGES: 10", 18", 24"
DEPTH GAGES: POCKET CALIPERS

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240 WEST 40th ST. • NEW YORK 18, N. Y.

Cable address: **AMICTOOL, N. Y.**

Add this dependable protection to your safety program . . .

ENCLOSURE SAFGUARD . . . SWEEP SAFGUARD
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Made for blanking, piercing, notching, cut-offs, chute, and automatic feeds. Adjustable to all sizes of dies. Gates can be tilted inward close to die. Staples may be moved up or down to straddle any obstruction. Easily attached to the press. Transparent shields furnished for the front or sides of guard.

Operator is protected as sweep arm clears the danger zone thru slight downward movement of the ram. Shield prevents operator from working back of the guard. Easily installed to operate right or left handed. Sweep arm adjustable for clearance of die or bolster.

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STRAND MANUFACTURING CO, Inc.

SAFETY ENGINEERS

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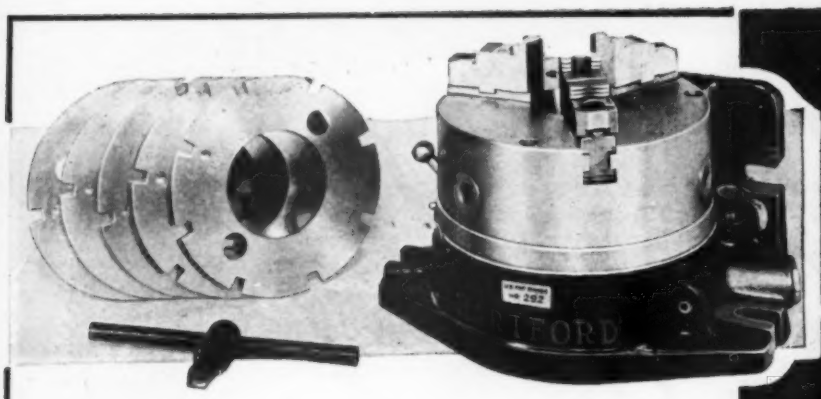
THE NEW MOTCH & MERRYWEATHER No. 2 Metal Sawing Machine

Motch & Merryweather announces the No. 2 Hydraulic Feed and Hydraulic Clamping Metal Sawing Machine for cutting ferrous and non-ferrous metals up to 6", round, square or multiple stock, or up to 12"x 5" standard I-beams. Features of design include positive clamping on either side of the saw blade, anti-friction headstock, single-lever control of feeding and clamping, positive clamping for multiple bars, and provision for fully automatic stock feed.

Write today for full details on the No. 2

Only M & M builds ALL 3: COLD SAW SAW BLADE BLADE GRINDER

THE MOTCH & MERRYWEATHER MACHINERY CO.
PENTON BUILDING CLEVELAND 13, OHIO



THE HARTFORD SUPER-SPACER

...proved as an accurate spacing device on an almost unlimited variety of operations

THE great emergency through which we have just passed has taught production men in the metal-working industry to take advantage of every possible means of cutting corners in cutting metal. Many shops have turned to the Hartford Super-Spacer for accurate control of countless new indexing operations and found this spacing device the answer to their problems of speeding work and maintaining accuracy.

The accumulated experience of war production is now available to apply to peace-time requirements. It will pay you to take advantage of this experience by outlining your indexing problems, and asking our engineers for recommendations.

With its attachments and fixtures, the Hartford Super-Spacer provides a practical, proved means of handling milling, drilling, jig boring and slotting faster and better than they have ever been handled before.

Get the latest information on the Hartford Super-Spacer and how it can be of invaluable help on your indexing operations.

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD 5, CONN.
Makers of the famous Hartford Super-Spacer

INTERCHANGEABILITY

Your KEY to MASS PRODUCTION With Speed-up and Lowered Costs

A. S. A. STANDARD PRECISION DRILL JIG BUSHINGS

Standard sizes and styles in stock for prompt delivery. Write for catalog showing table of standard sizes of bushings with price list and other valuable information for the tool designer.

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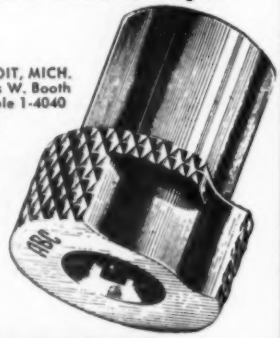


ACCURATE BUSHING CO.
440 North Ave., Garwood, N. J.

Almond Drill Chuck

The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field—the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes *to fit all machine tools and portable drills.*

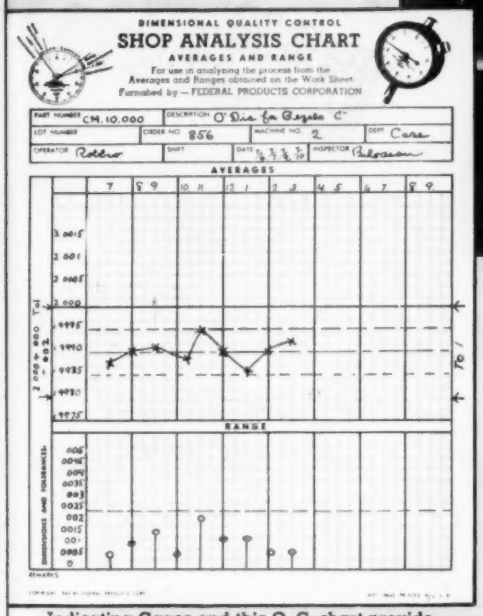
Write for complete details

T. R. ALMOND MFG. CO.
ASHBURNHAM, MASS., U. S. A.

The Original Manufacturers of Drill Chucks

DIMENSIONAL *QUALITY CONTROL

Dimensional quality is controlled directly at the machine.



Indicating Gages and this Q. C. chart provide the data and means to keep dimensions under control.

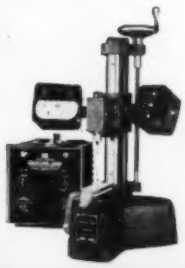
3 GAGING SYSTEMS

MECHANICAL

Adaptable and economical Dial Indicating Gages for the usual control requirements.

AIR

A new air System for extremely fine finishes and measurements. Many new exclusive features.



ELECTRONIC

An extremely fast, sensitive instrument with a multitude of possibilities.

Economical Control at Production — a Management Tool

Federal Indicating Gages plus Quality Control Charts Make Graphic what is happening at the Machine

The case history of the application illustrated above of Quality Control by statistical methods, based on the accurate readings of the Federal Indicating Gage, shows the practical result of controlling a critical dimension of our own product.

A piece intrinsically difficult to turn, a dimension hard to maintain, and an out-of-round condition prohibited by assembly conditions. Rejects, rework and scrap ran high, unit hours low. Imperfections at this operation directly fostered inaccurate performance of the finished instrument.

After the introduction of Quality Control scrap figures dwindled by 75%. Even greater satisfaction was gained from the even flow of homogeneously dimensioned pieces coming from this operation.

With Quality Control and Federal Indicating Gages inaccuracies are discovered *before* they develop, operator interest increases, wasted time and material disappear and a product is made that renders better service to the ultimate user.

Write for the Federal Quality Control Primer, a simplified, practical way to apply Quality Control.

FEDERAL PRODUCTS CORPORATION

1144 EDDY STREET PROVIDENCE 1, R. I.

The Federal Quality Control Primer will be mailed to anyone interested in this new management tool.

**Quality Control by Statistical Methods.*

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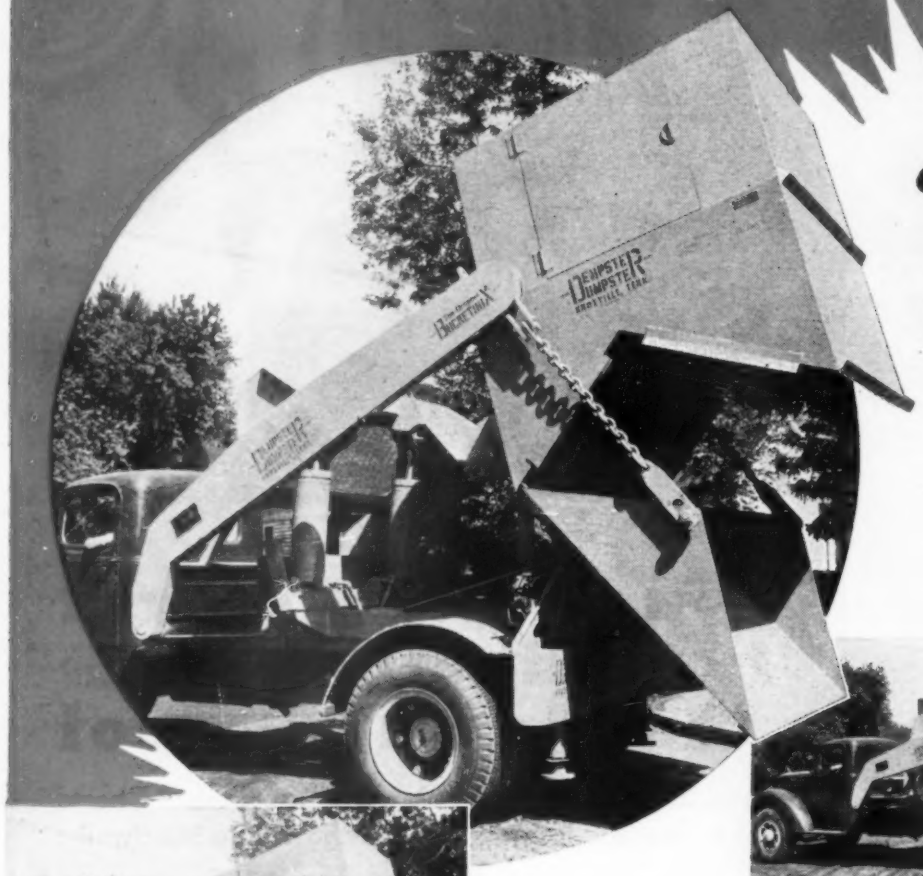
PRECISION MEASURING INSTRUMENTS

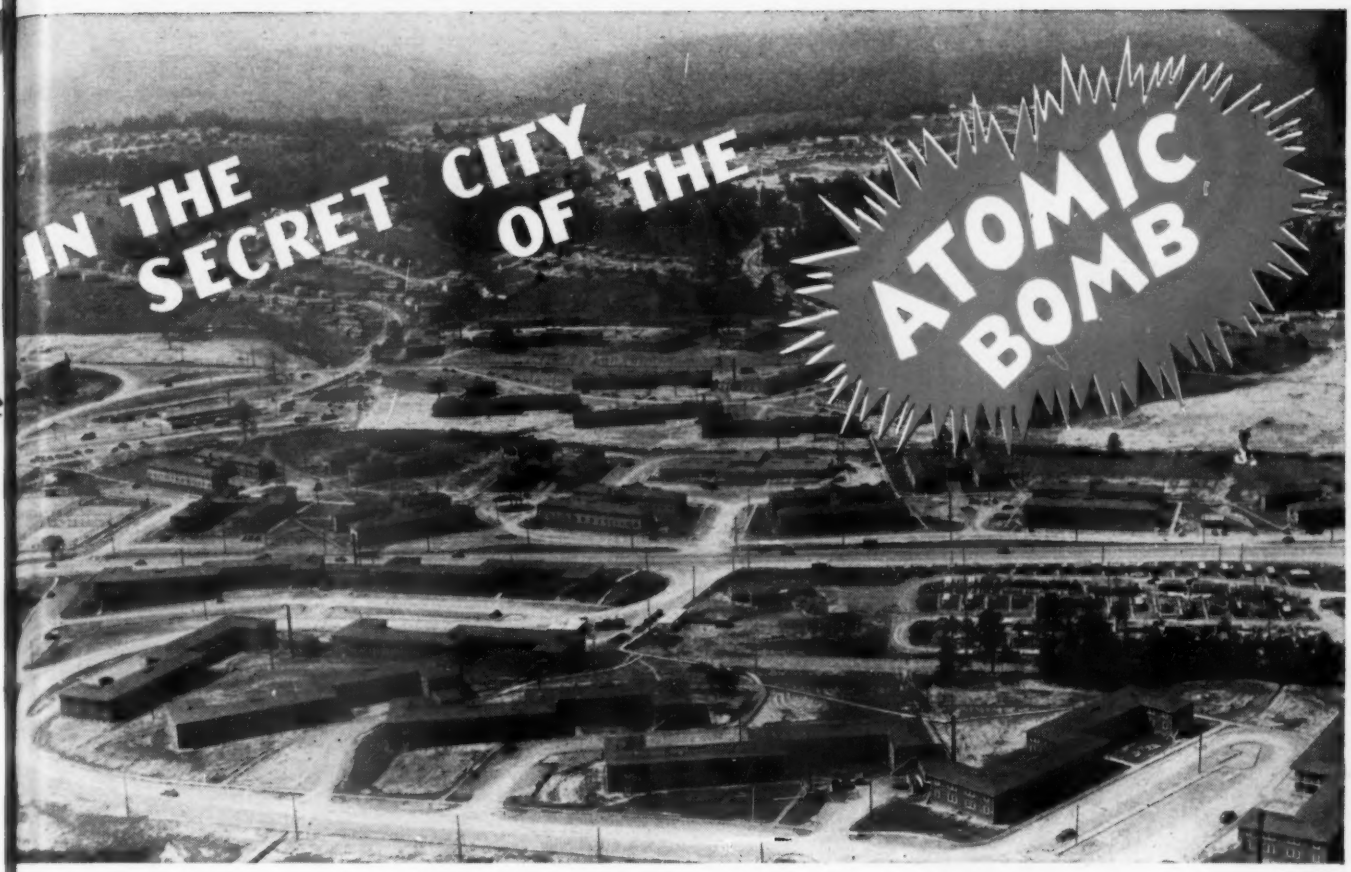
The DEMPSTER DUMPSTER

TRADE MARK REG.



ONE TRUCK—3 TYPES OF BODIES . . .

Shown on these pages is a typical example of Dempster-Dumpster service. In this case the single Dempster-Dumpster Hoisting Unit truck, shown above, and delivered to an Eastern firm, serves 18 bodies—6 each of 3 different types. Above you see the pick up, hauling and dumping operations of an 8 cubic yard, bottom-dumping body. Directly below are the same operations of a 6 cubic yard, Tilt-type body. Below, on opposite page are shown the same operations of a 6 cubic yard, skip-type body . . . three types of bodies for handling 3 types of materials, but only one truck—on the jump—serving all of the 18 bodies.



A WAR MATERIALS HANDLING STORY OF DEMPSTER-DUMPSTER SPEED AND EFFICIENCY

At a time when speed in production was probably more important to the civilized world than ever before, the Dempster-Dumpster System of Materials Handling made an outstanding contribution in efficiency. Adapting the revolutionary system of One Dempster-Dumpster Hoisting Unit serving multiple bodies, of various sizes and designs, to handle any type of material, Dempster-Dumpster probably established a record in time and equipment saving.

In three operating divisions of the Clinton Engineer Works—birthplace of the Atomic Bomb—Dempster-Dumpster materials handling systems are serving as follows:

In one division a single Dempster-Dumpster Hoisting Unit is serving 17 bodies of 3 different types and 3 different capacities. This means that one truck equipped with a Dempster-Dumpster Hoisting Unit is doing the work of 8 to 12 ordinary trucks in an uninterrupted cycle of materials handling. It means also, that standing idle time has been eliminated for 8 to 12 trucks and drivers.

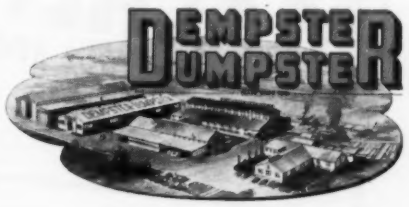
In a second division only four Dempster-Dumpster Hoisting Unit trucks are used for the busy job of serving fifty-one bodies of 5 different designs and six different capacities, ranging from 2½ to 10 cubic yards. These bodies are designed to handle materials of every description from dust to liquid.

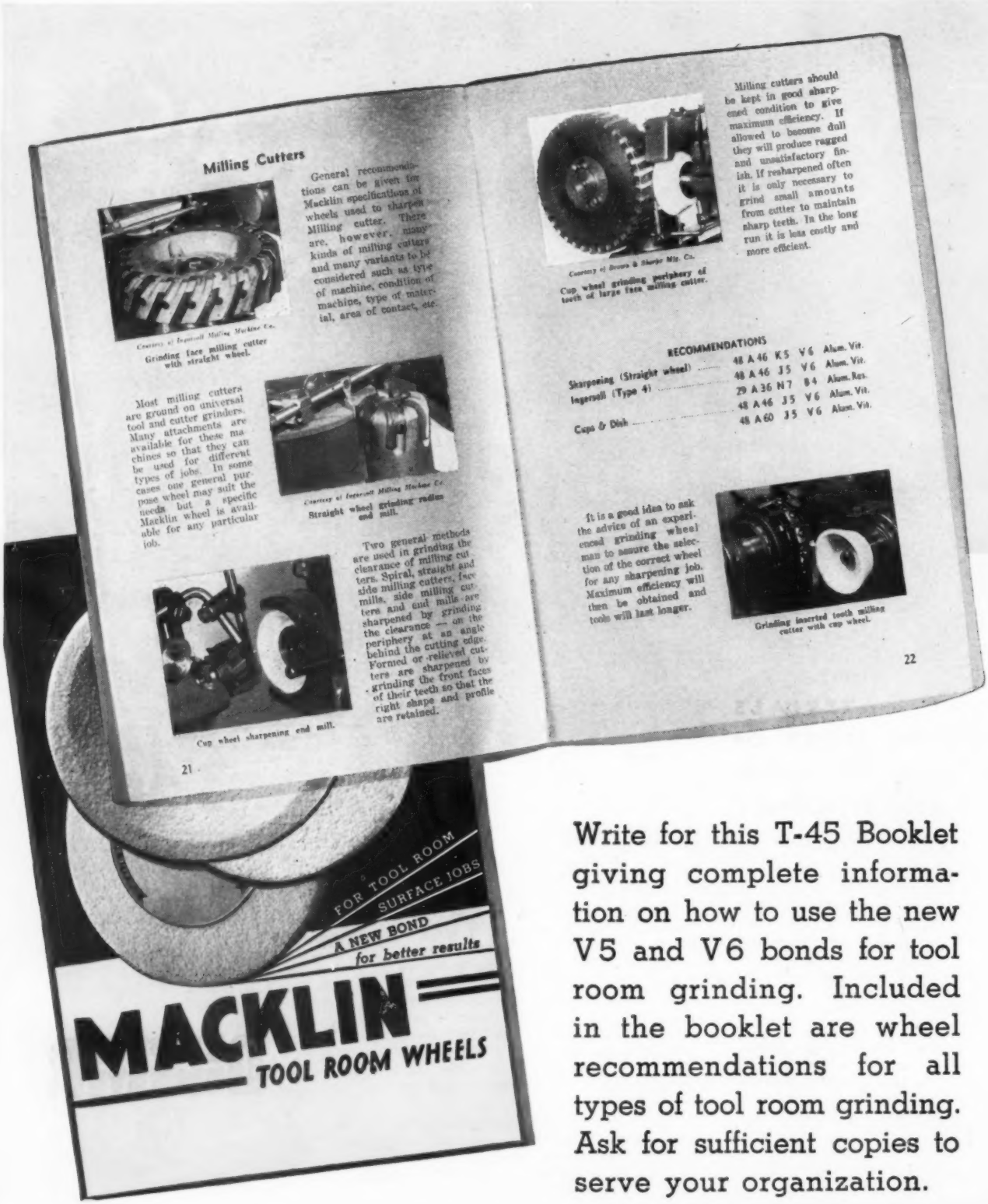
Still another interesting account comes from a third division at the Secret City. This division employs only 7 Dempster-Dumpster Hoisting Unit Trucks to serve one hundred and sixty-one (161) Dempster-Dumpster bodies of 2 different designs, all 6 cubic yard capacities, in a never-ending stream of efficient and economical service.

Just as the Dempster-Dumpster System of Materials Handling has adapted itself over the past several years to the growing needs of industrial plants, so its versatility and speed-up system met the war emergency at Oak Ridge.

Dempster-Dumpster Hoisting Units and Multiple Bodies are available for handling every conceivable type of material—from raw materials to finished product . . . for inside and outside plant use, in volume capacities from 1½ to 10 cubic yards . . . weight capacities from 1½ to 7½ tons pay load.

The Dempster-Dumpster system is a simple and sure method of making tremendous savings in truck equipment and consequent expense of tires, gas and men. Our engineers will be glad to go over your materials handling problems with you. DEMPSTER BROTHERS, INC., KNOXVILLE 17, TENNESSEE.




Milling Cutters
General recommendations can be given for Macklin specifications of wheels used to sharpen Milling cutter. There are, however, many kinds of milling cutters and many variants to be considered such as type of machine, condition of machine, type of material, area of contact, etc.
Courtesy of Ingersoll Milling Machine Co.
Grinding face milling cutter with straight wheel.
Most milling cutters are ground on universal tool and cutter grinders. Many attachments are available for these machines so that they can be used for different types of jobs. In some cases one general purpose wheel may suit the needs but a specific Macklin wheel is available for any particular job.
Courtesy of Ingersoll Milling Machine Co.
Straight wheel grinding radius end mill.
Two general methods are used in grinding the clearance of milling cutters. Spiral, straight and side milling cutters, face mills, side milling cutters and end mills are sharpened by grinding the clearance — on the periphery at an angle behind the cutting edge. Formed or relieved cutters are sharpened by grinding the front faces of their teeth so that the right shape and profile are retained.
Cup wheel sharpening end mill.
21
Milling cutters should be kept in good sharpened condition to give maximum efficiency. If allowed to become dull they will produce ragged and unsatisfactory finish. If resharpened often it is only necessary to grind small amounts from cutter to maintain sharp teeth. In the long run it is less costly and more efficient.
Courtesy of Brown & Sharpe Mfg. Co.
Cup wheel grinding periphery of teeth of large face milling cutter.
RECOMMENDATIONS
Sharpening (Straight wheel) ..... 48 A 46 K5 V6 Alum. Vit.
Ingersoll (Type 4) ..... 48 A 46 J5 V6 Alum. Vit.
29 A 36 N7 B4 Alum. Res.
Cups & Dish ..... 48 A 46 J5 V6 Alum. Vit.
48 A 60 J5 V6 Alum. Vit.
It is a good idea to ask the advice of an experienced grinding wheel man to assure the selection of the correct wheel for any sharpening job. Maximum efficiency will then be obtained and tools will last longer.
Grinding inserted tooth milling cutter with cup wheel.
22
FOR TOOL ROOM SURFACE JOBS
A NEW BOND for better results
MACKLIN
TOOL ROOM WHEELS

Write for this T-45 Booklet giving complete information on how to use the new V5 and V6 bonds for tool room grinding. Included in the booklet are wheel recommendations for all types of tool room grinding. Ask for sufficient copies to serve your organization.

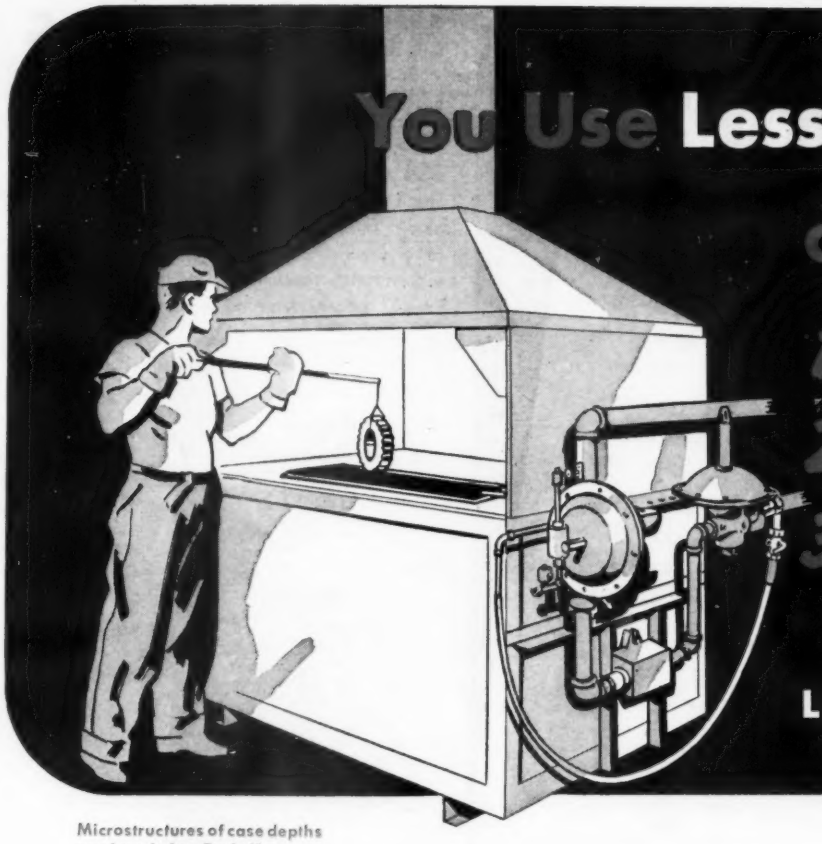
MACKLIN COMPANY

Manufacturers of GRINDING WHEELS — JACKSON, MICHIGAN, U. S. A.

Distributors in all principal cities

Sales Offices: — Chicago - New York - Detroit - Pittsburgh - Cleveland - Cincinnati - Milwaukee - Philadelphia

You Use Less Floor Space and Get . . .



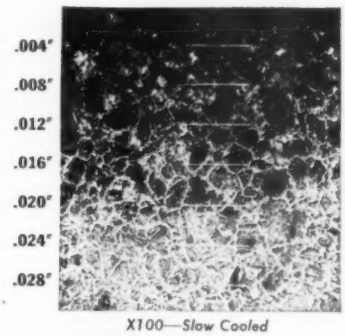
1 RAPID CARBURIZATION

2 UNIFORM CASE DEPTHS

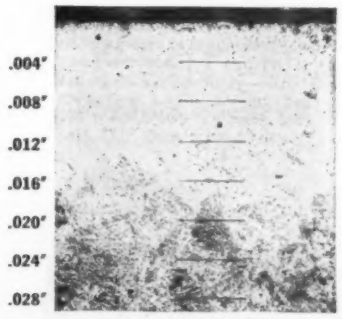
3 LOW DISTORTION in . . .

Park-Kase LIQUID CARBURIZERS

Microstructures of case depths produced by Park-Kase on AISI C1019 steel in two hours at 1600°F.



X100—Slow Cooled
(Reduced in printing)



X100—Brine quenched
(Reduced in printing)

RAPID CARBURIZATION is provided by Park-Kase. (See table below.) Case depths up to one-eighth of an inch are possible with suitable time-temperature cycles.

UNIFORM CASE DEPTHS are a result of the rapid and even rates of heating obtained in Park-Kase.

LOW DISTORTION is guaranteed by the rapid and even heating, uniform case depths, accurate temperature control, and ease of direct quenching from Park-Kase.

SIMPLE OPERATION of Park-Kase requires no rigid chemical control or strict replenishment schedule. Complicated equipment and highly skilled personnel are not necessary.

SELECTIVE CARBURIZATION in Park-Kase is accomplished with No-Kase (a special stop-off paint) or copper plating.

ECONOMICAL operation of Park-Kase results from the incorporated carbon cover which inhibits salt decomposition, restricts fuming, and saves fuel by preventing excessive heat radiation.

TOTAL CASE DEPTHS ON SAE 1020

Time	1500°F.	1550°F.	1600°F.	1650°F.	1700°F.	1750°F.
30"	.007"	.0085"	.0105"	.012"	.014"	.016"
1 Hr.	.012	.015	.017	.019	.021	.028
2 Hr.	.017	.021	.025	.029	.032	.040
4 Hr.	.024	.029	.035	.041	.047	.060
6 Hr.	.030	.036	.043	.052	.060	.071

Park CHEMICAL COMPANY
8074 Military Ave., Detroit 4, Mich.

● Liquid and Solid Carburizers ● Cyanide, Neutral, and High Speed Steel Salts ● Coke ● Lead Pot Carbon ● Charcoal ● No Carb ● Carbon Preventer ● Quenching and Tempering Oils ● Drawing Salts ● Metal Cleaners ● Kold-Grip Polishing Wheel Cement.

LICENSED MANUFACTURER: Electric Resistance Furnace Co., Ltd., Weybridge Surrey, England

TAPPING TIPS

From Woody Spencer's Notebook

GIVE 'EM THE WHOLE STORY

Way back when I was a kid in school I used to have to write over and over from the copybook "A little knowledge is a dangerous thing." Never thought then it would apply to taps. But it sure does. One of the pet gripes from my tool crib friends is that the boys in the shop don't give 'em enough information on a tap job. Then, when the tap don't work, they get the kick back. Works the same way when ordering taps too. Best thing is to give all the information possible. What kind of material? Is it a blind hole or a through hole? What's the diameter, the depth? What tolerance? That's the information that decides style of tap, number of flutes, chamfers and all the details that work together to give a fast, smooth tapping job.

Woody's Tapping Tips are by no means intended as technical advice on tapping. They are merely a collection of hints, ideas, suggestions and shop short cuts gathered by Woody in his travels among shops all over the country. Their real purpose is to smooth out and speed up routine tapping jobs, save time and cut rejects.

Where specific problems come up, definite engineering advice should be obtained. If you will send complete data on a job—material, depth, diameter, lubricant, etc.—our engineers will be glad to make recommendations. No obligation, of course.

Note—Woody Spencer's Tapping Tips are appearing here as often as Woody gets time to write them up. Look for them.

Woody Spencer's new Tap Guide is full of handy information that will help in tapping operations. It's free. *Write for your copy on the company letterhead.*

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The Wood & Spencer Company
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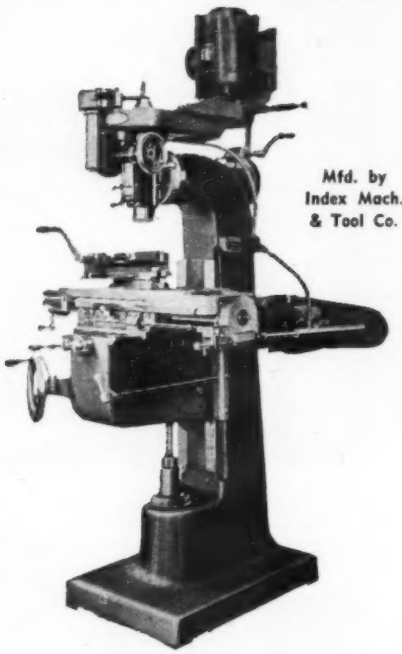

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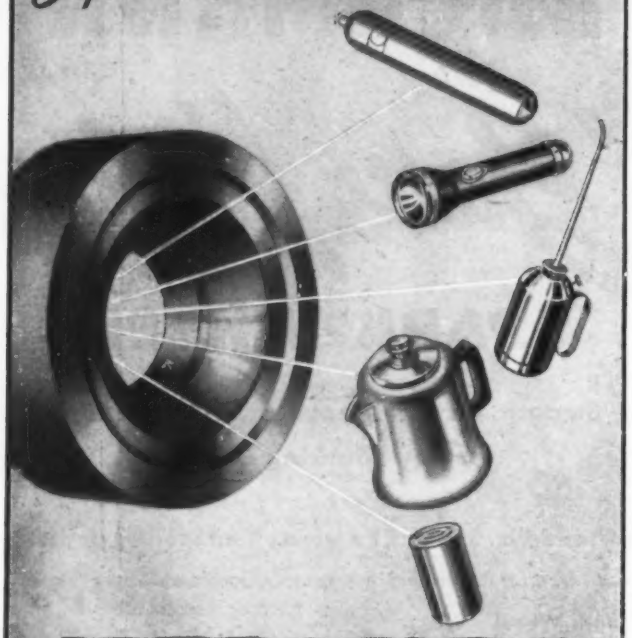

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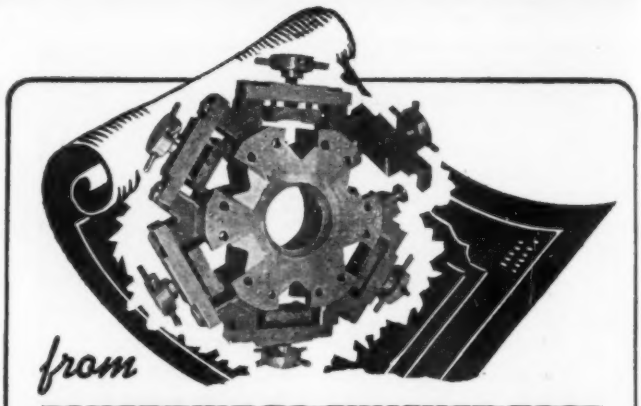

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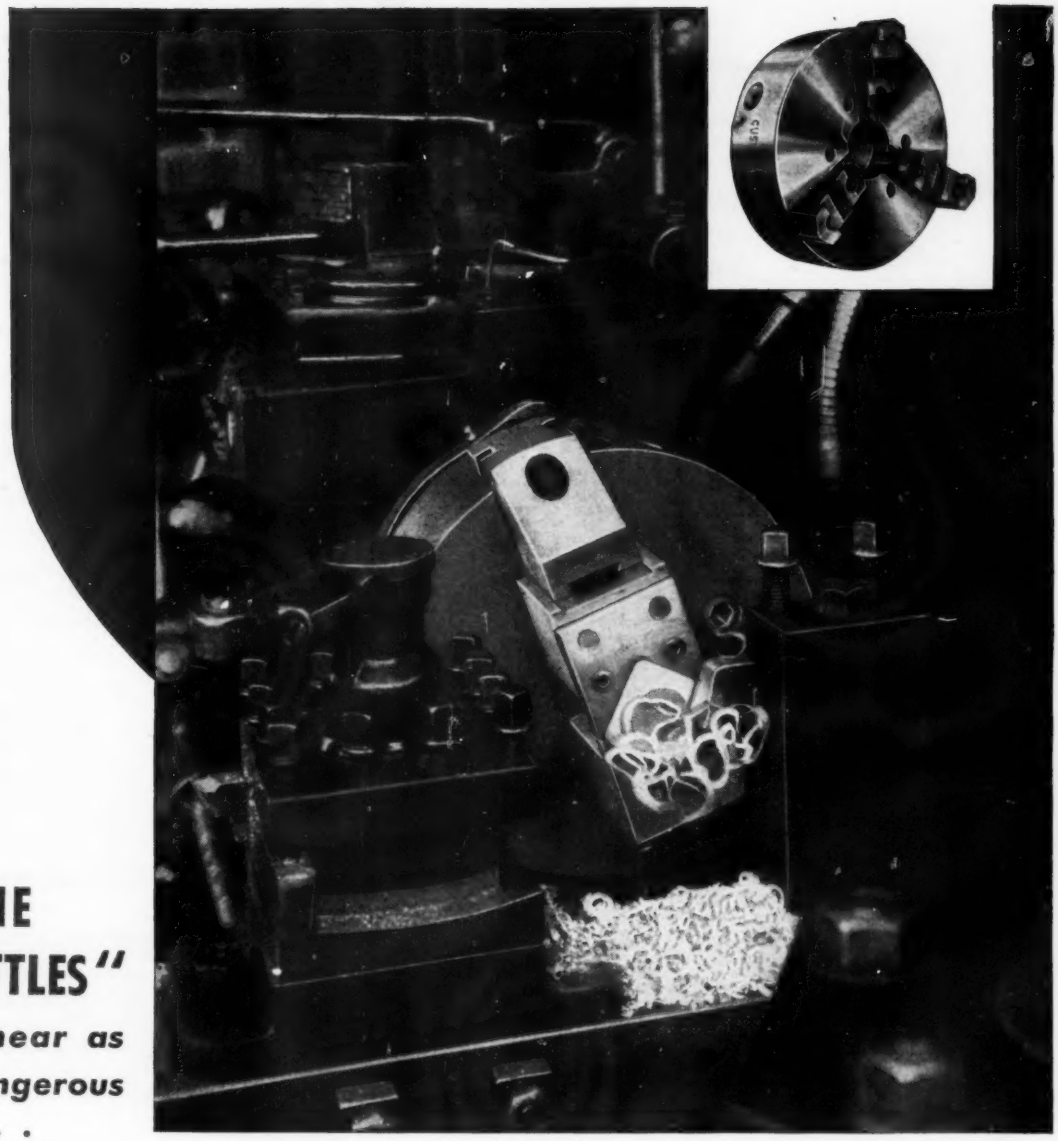

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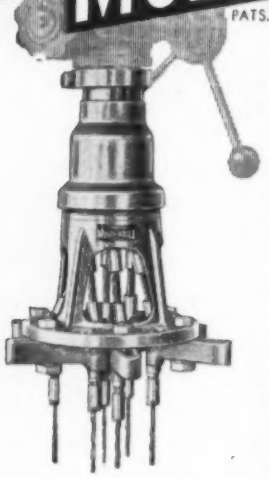

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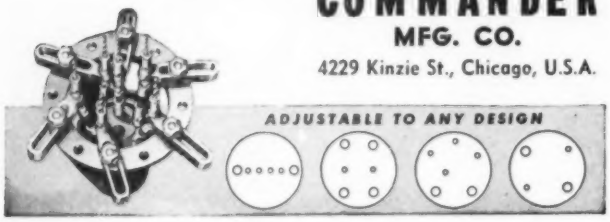

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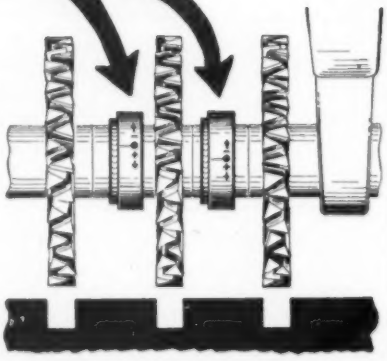

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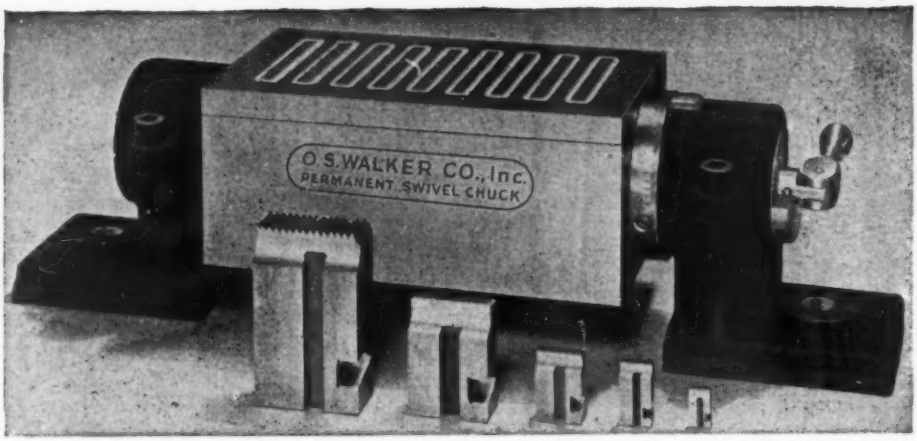

These new Permanent Magnetic chucks—with 35% more holding power, greater effective magnetic area, are the result of Walker's many years specialization. Their greater holding power is retained indefinitely.

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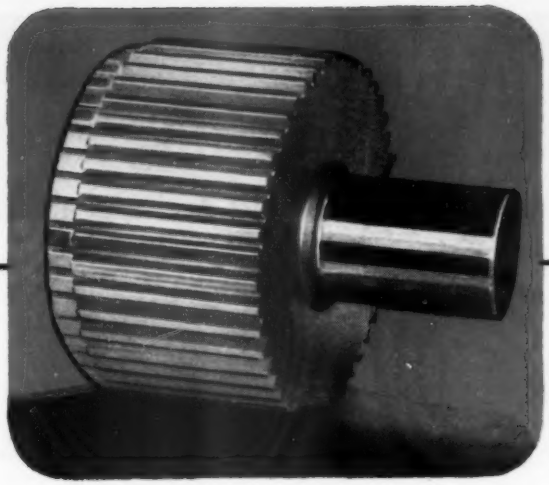

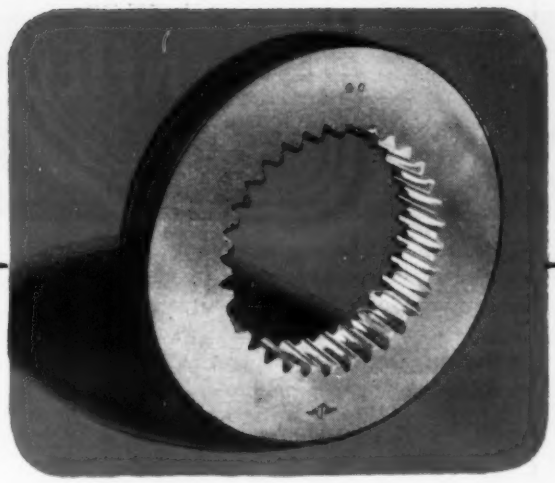

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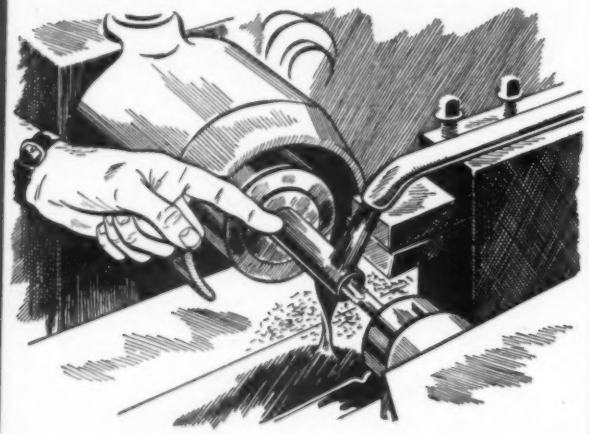
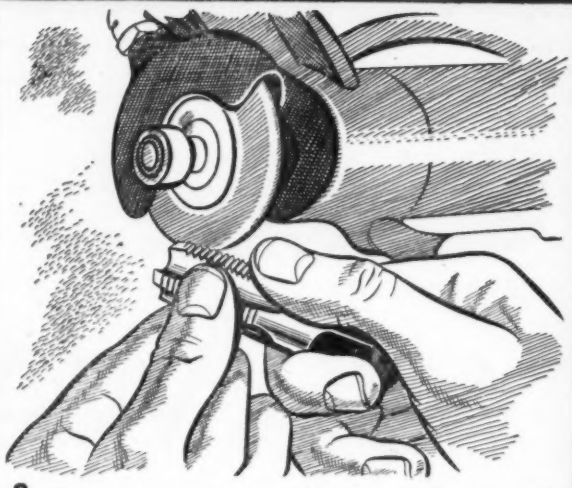
"GREENFIELD MAN" SOLVES TAPPING PROBLEM FOR NEW JERSEY MACHINE SHOP

[A GTD SHOW-HOW REPORT]

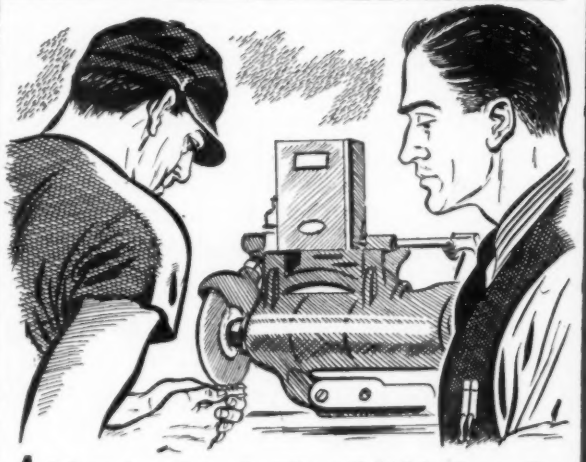
1 This firm was having tapping trouble—cutting torn and oversize threads. A "Greenfield Man" called in, discovered that the turret lathe spindle holding the work was off center causing run-out, and that the nut itself was bronze instead of brass as specified on the original tap order.





2 Having diagnosed the trouble, the "Greenfield Man" had the run-out in the spindle eliminated and himself re-ground one of the taps (a ⅜"-18 Commercial Ground Straight Pipe Tap) with a hook for bronze.

3 He suggested that in re-ordering taps they inform "Greenfield" that the material was hard bronze. He also recommended that they specify 5 lands instead of 4 as the narrower lands would minimize friction. In this way, he insured that they would get maximum tapping performance on this particular job in the future.



4 More than that, the "Greenfield Man" actually showed the operator how to salvage the taps the firm had on hand for this job, simply by grinding off the extra threads on the chamfer and correcting the cutting angle.

Results!

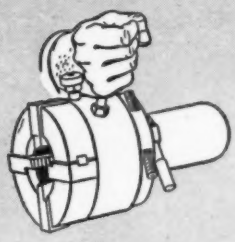
"Greenfield" know-how plus "Greenfield" show-how solved a threading problem that was causing work spoilage and loss of production. The "Greenfield Man" not only found and corrected the trouble on the spot, but he also showed how to get better results in the future by ordering the right tap for the job. Finally, he saved the firm money and delay by showing how to re-grind their stock of taps.

ON THREADING PROBLEMS SIMPLY CALL YOUR "GREENFIELD MAN" THROUGH YOUR "GREENFIELD" DISTRIBUTOR!

GREENFIELD TAP and DIE CORPORATION
GREENFIELD, MASSACHUSETTS

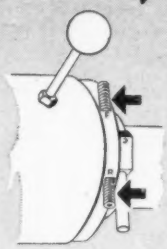
IT'S SO SIMPLE TO CUT GOOD THREADS WITH A "GEOMETRIC"

1. SIMPLE TO OPERATE



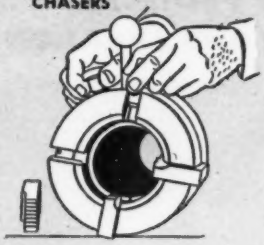
Positive camming arrangement releases chasers automatically so die head can be withdrawn from work without reversing.

2. SIMPLE TO ADJUST



A quick and positive adjustment of the chasers to the required decimal size may be made by means of two opposed adjusting screws.

3. SIMPLE TO CHANGE CHASERS



Just pull a stop plunger and the chasers can be taken out in an instant and replaced. Spring tension keeps chasers from falling out by themselves.

4. SIMPLE TO RE-SHARPEN

Chasers can be removed quickly from die head and can be sharpened accurately by means of a simple grinding fixture.

Many years ago the men at Geometric began building die heads to cut external threads. The first models seem as crude today as the first automobiles which they helped to make. But, like the early automobiles, the early Geometric Die Heads were admired and respected as mechanical marvels.

Today's line of Geometric Die Heads is, by comparison, "stream-lined" in its modern simplicity of design and operation. There is a model to fit most types of machines and to solve your threading problems.

SO WHEN YOU THINK OF THREADS, THINK OF "GEOMETRIC," BECAUSE THE MEN AT GEOMETRIC HAVE BEEN THINKING CONSTANTLY OF THREADS AND HOW TO CUT THEM FOR OVER HALF A CENTURY.

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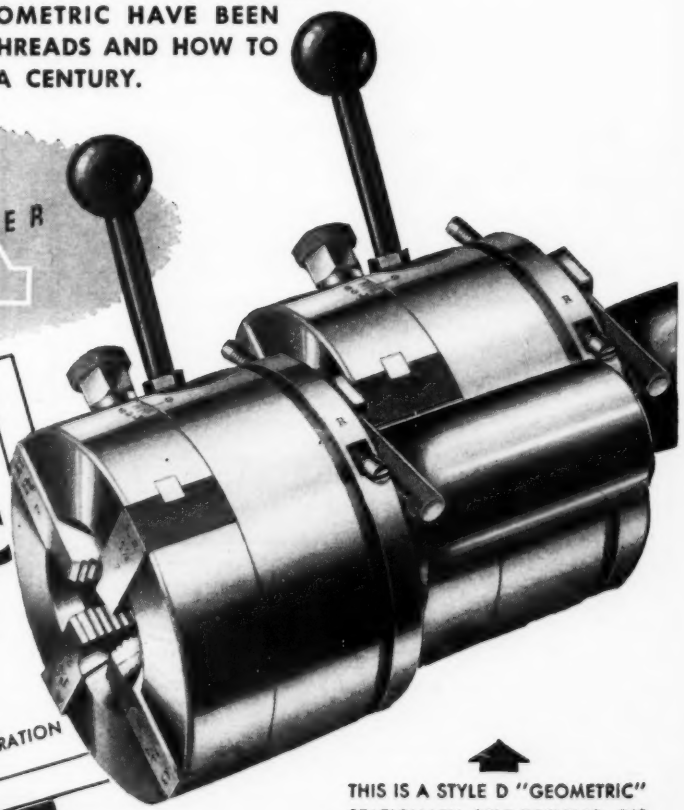

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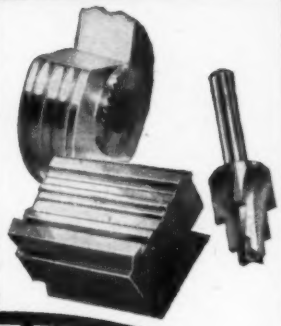

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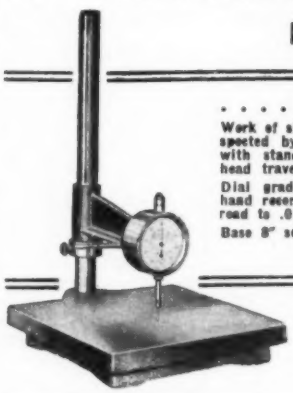

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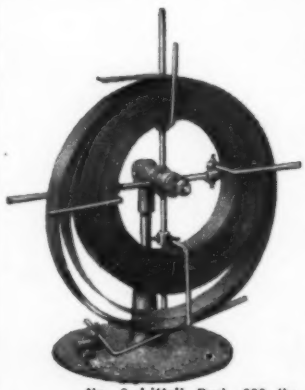

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Gages bearing the PM Diamond Emblem promise you the utmost in accuracy, and then live up to that promise. Careful finishing slows down gage wear and helps you uphold high standards and close tolerances.

When you retool for new production, let Pipe Machinery engineers help you.

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TOOL STEEL DATA

Revised Data for Water Hardening Tool Steels including types, analyses, uses, hardening characteristics and temperature ranges

DECEMBER, 1945

WATER HARDENING TOOL STEEL CHARACTERISTICS

TYPE	GRADE	ANALYSIS	USES Water Hardening Tool Steel for Cold Work Dies and Tools Requiring:	HARDENING CHARACTERISTICS		
				HARDENING TEMPERATURES	QUENCH	RC
Carbon Alloy Treated	SPECIAL	C * Mn .25 Si .25 Cr .15 V .04	• Highest Quality • Keen Cutting • High Surface Hardness with a Tough Core	Range: 1420° F. to 1530° F. Cutting and Shearing Tools: 1420° F. to 1450° F. Parts Subject to Steady Pressure: 1440° F. to 1480° F. Dies Subject to Severe Blows: 1470° F. to 1530° F.	Water or Brine	64-66
Carbon	EXTRA	C * Mn .25 Si .20	• High Hardness of Medium Depth • Good Wear Resistance • Shock Resistance	Range: 1425° F. to 1550° F. Cutting and Shearing Tools: 1425° F. to 1450° F. Forming; Steady Pressure Tools: 1440° F. to 1490° F. Dies Subject to Heavy Blows: 1500° F. to 1550° F.	Water or Brine	64-66
Carbon Vanadium	VANADIUM EXTRA	C .95 Mn .30 Si .25 V .20	• Increased Wear Resistance • Added Toughness and Fatigue Resistance	Range: 1450° F. to 1500° F.	Water or Brine	64-66
Carbon Chrome	WATERDIE	C 1.00 Mn .35 Si .25 Cr. .55	• Uniform Strong Case in Large Sections • High Wear Resistance	Range: 1500° F. to 1525° F.	Water or Brine	64-66
Carbon Manganese	EXTRA HEADER DIE	C .95 Mn .35 Si .25	• Uniform Deep Hardening in tools such as Header Dies	Range: 1475° F. to 1550° F.	Water or Brine	64-66
QUENCHING: A brine quench 60° to 80° F. is recommended. Remove tools from the quench at approximately 300° F. and cool in air to about 125° F. and temper immediately.						
TEMPERING: These are usually tempered from 300° F. to 600° F. As the temperature increases, hardness decreases and toughness increases.						
NOTE: These steels meet rigid Hot Etch and Hardenability Standards. Water hardening steels harden with a depth of case of 1/8" to 1/4" depending on Mass, Hardening Temperature and Hardenability. *Available in 3 carbon ranges: approx. C 1.15; approx. C 1.05; and approx. C .95.						

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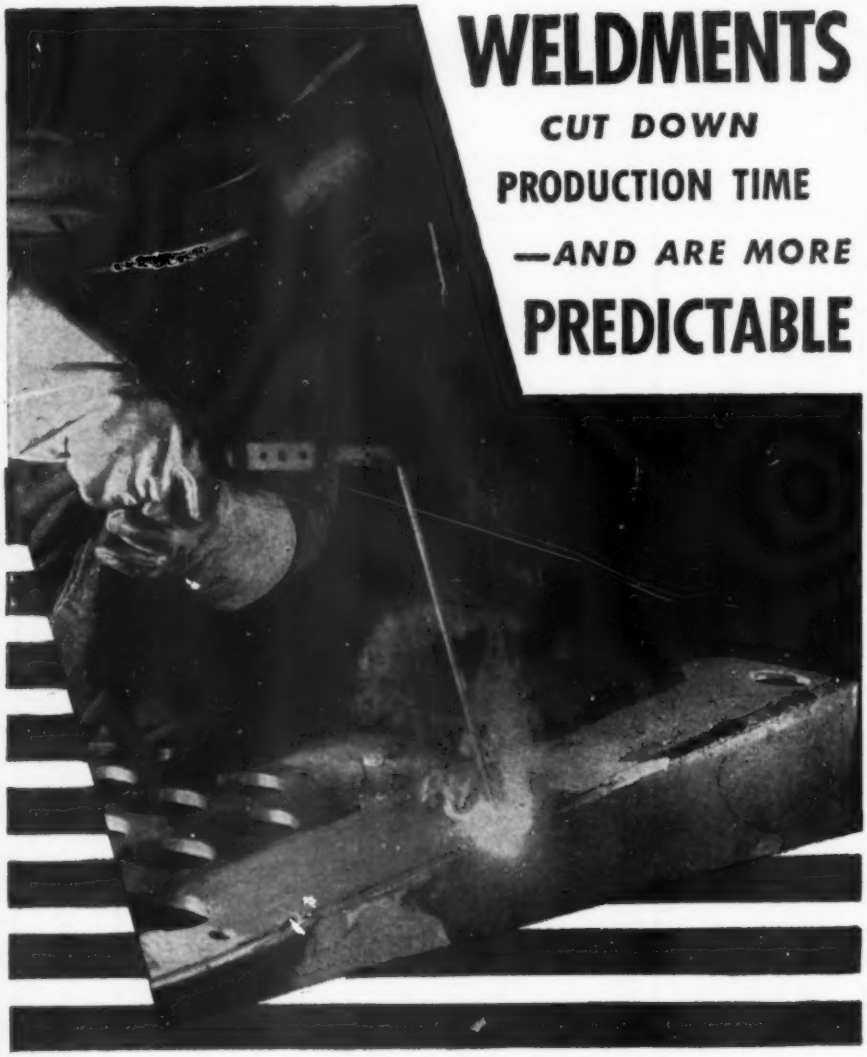

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Weldments almost invariably effect substantial savings in production time. There are no blow holes to show up after considerable time has been spent on machining, thus forcing a costly part to be scrapped.

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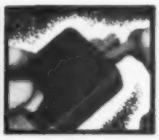

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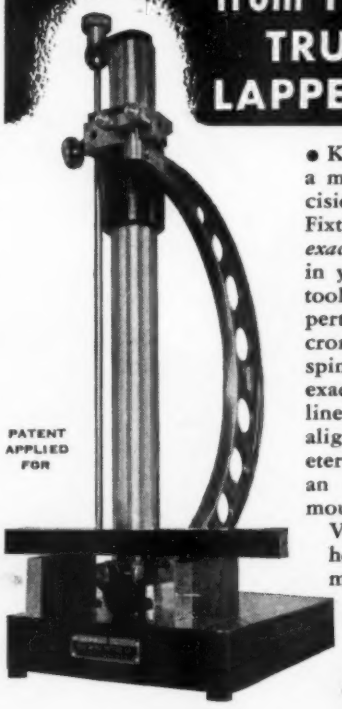

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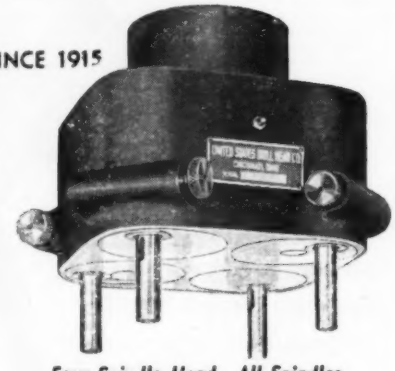

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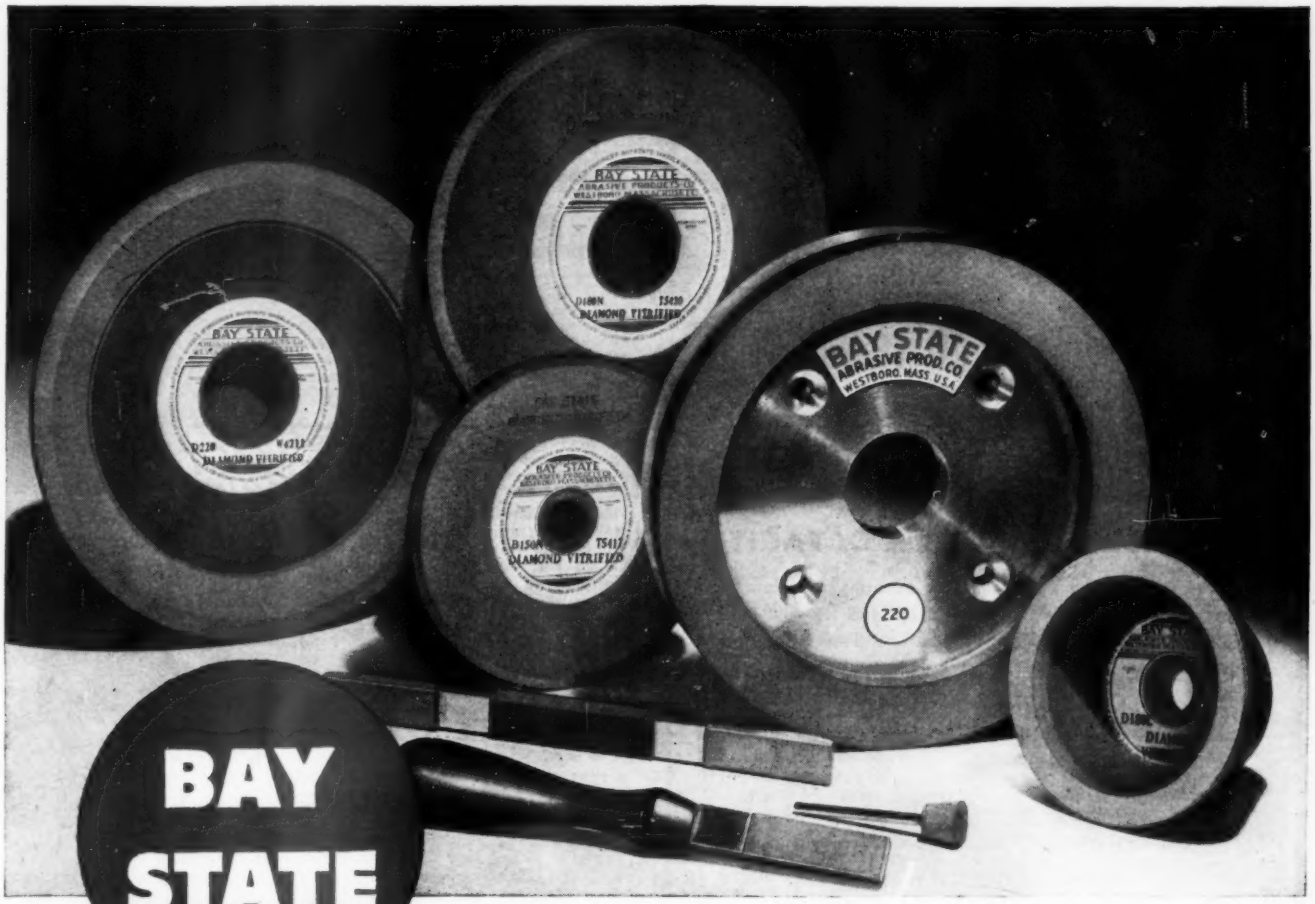

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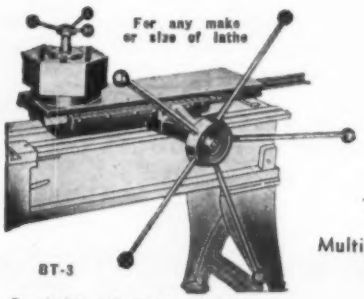

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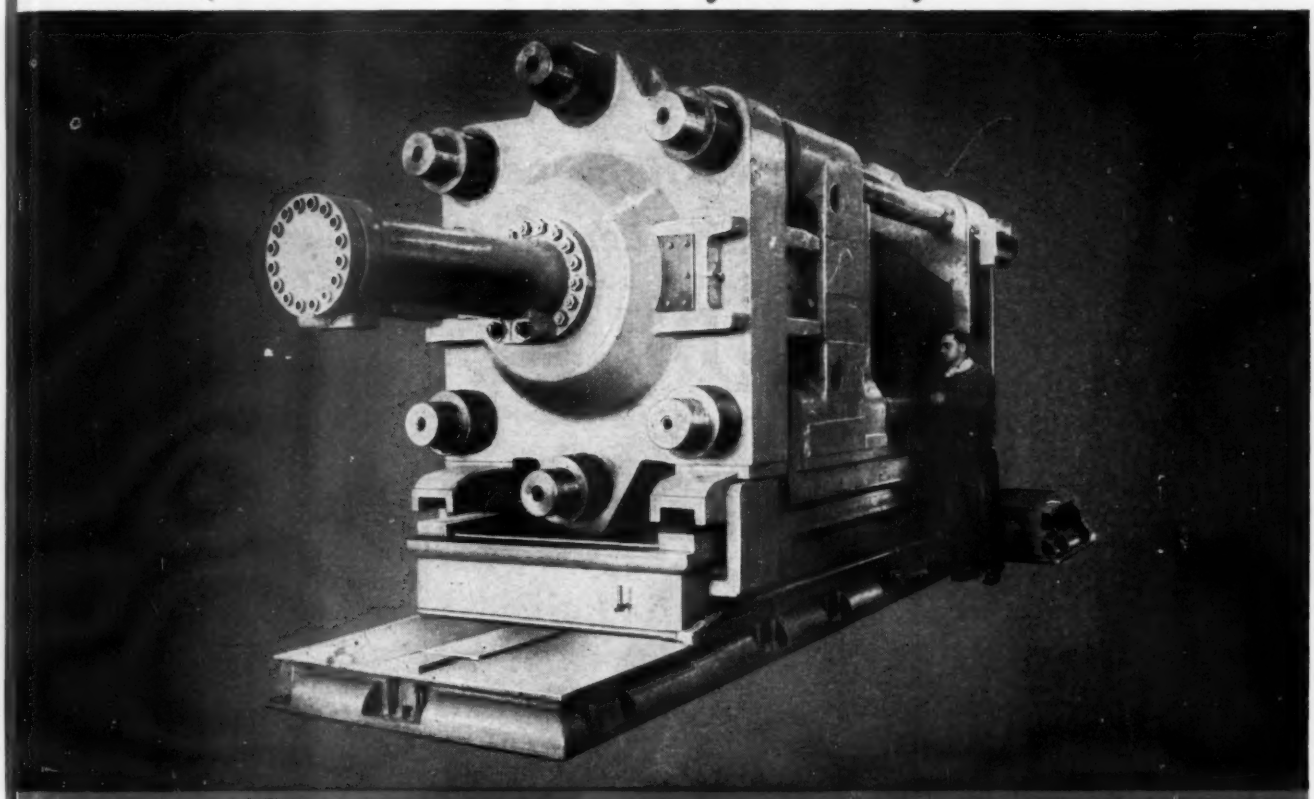

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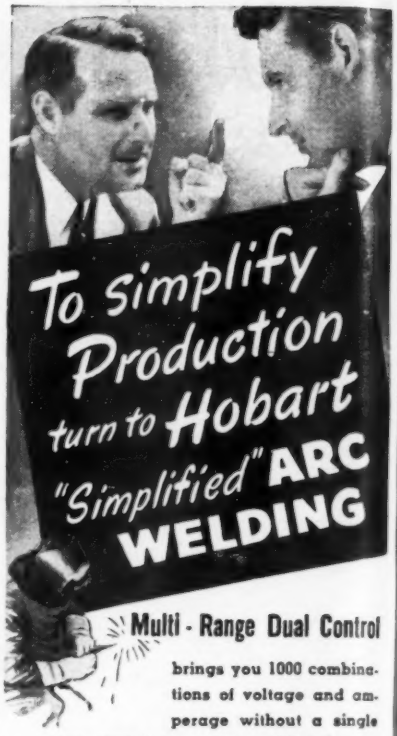

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Multi-Range Dual Control

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lets operator make adjustments at the work, eliminating the necessity of returning to the welder every time electrode or welding position is changed.

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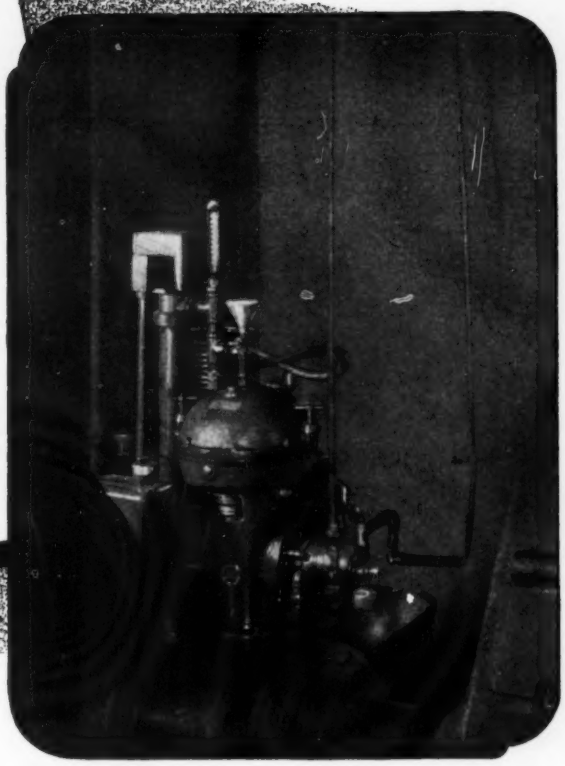

DE LAVAL Oil Purifiers remove by centrifugal force the sludge and foreign matter from hydraulic oil, preventing scoring of valves and costly down time. Instantaneously and continuously the oil is restored to its "like-new" purity, so that it can be used safely over and over again.

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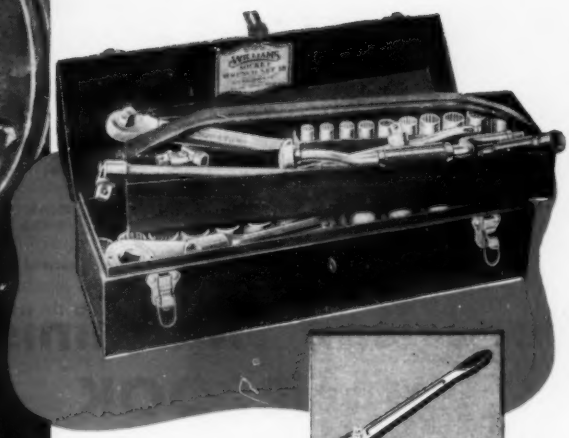

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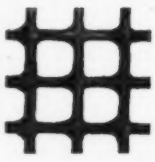

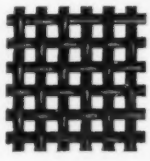

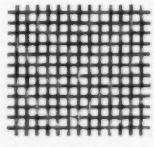

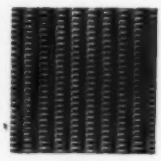

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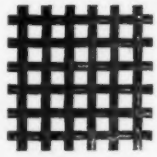

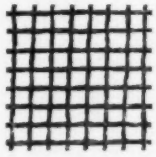

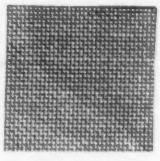

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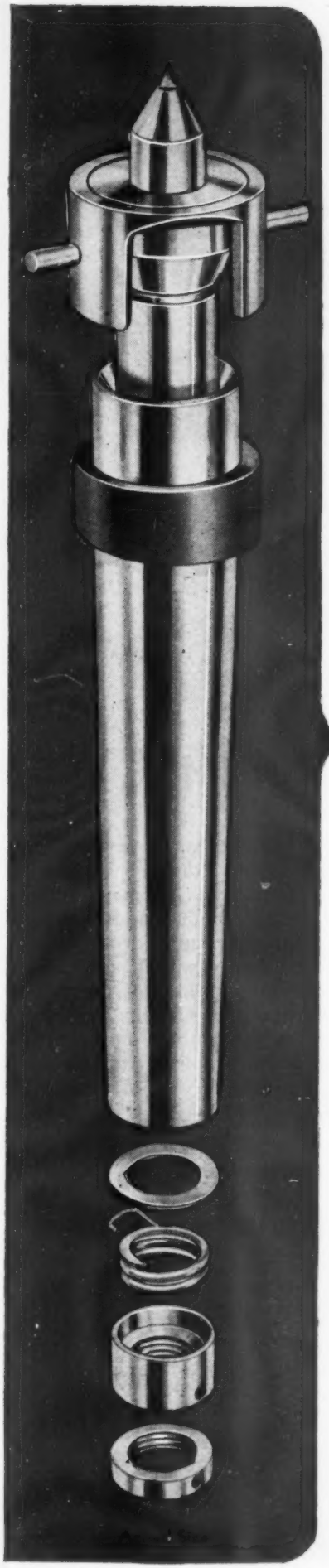

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Production of many kinds of cylindrical grinding can be more than doubled by replacing ordinary head stock center with a "CENTER DRIVE".

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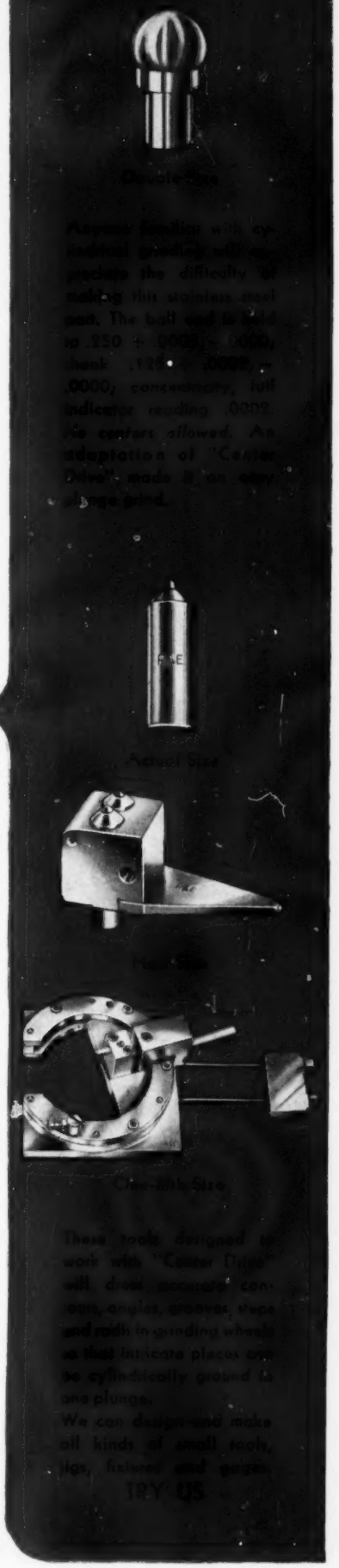
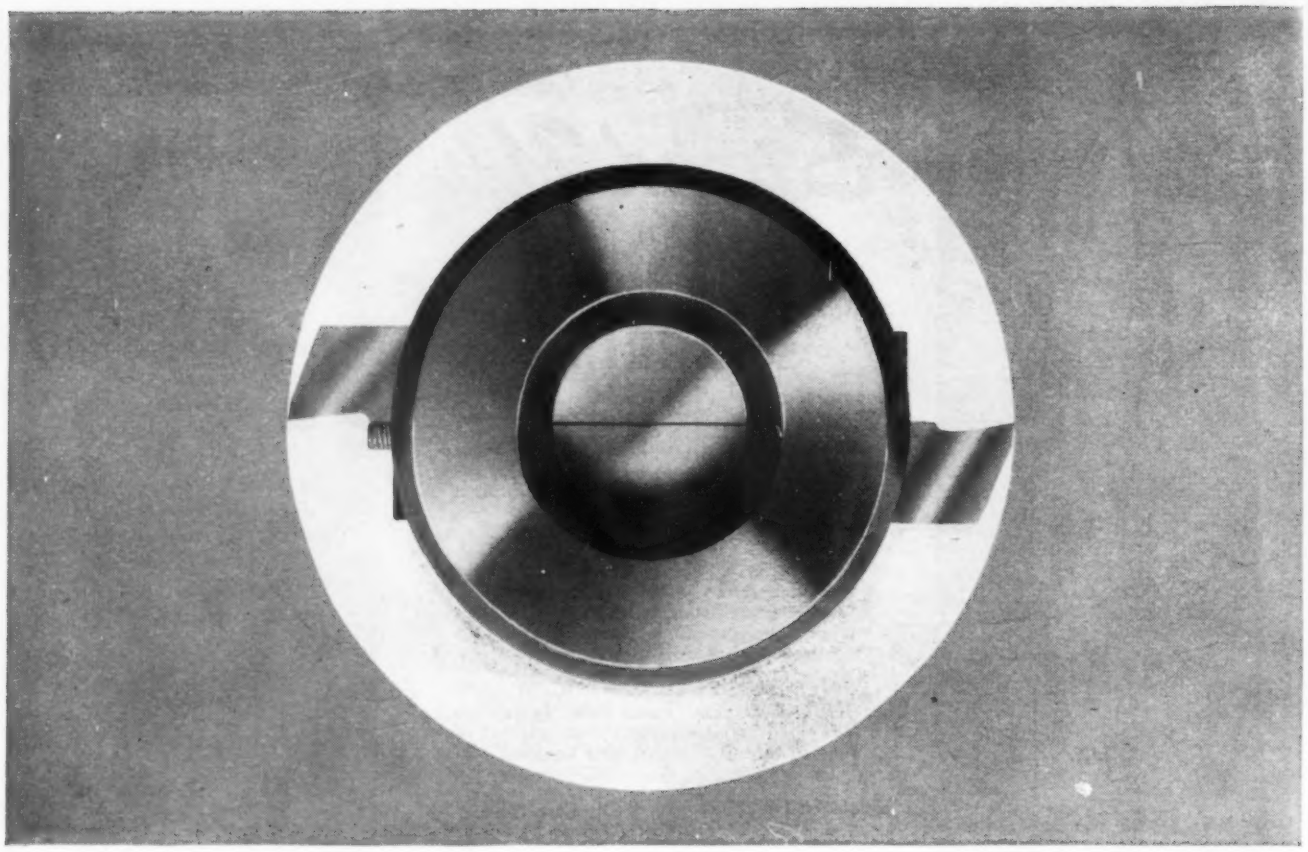




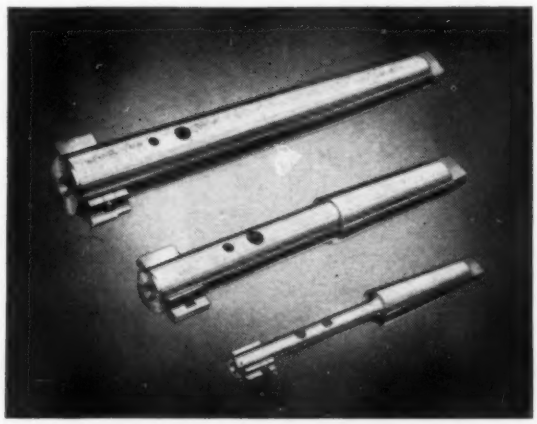
WHY USE MORE WHEN TWO ARE ENOUGH?

Why use a complicated multi-blade type reamer when the simply constructed Madison two-bladed reamer will do the job quickly, efficiently and at less cost per hole?

Check these features in the end view illustration of a Madison shown above: Cooler cutting because two blades allow more room for chip clearance and circulation of coolant. This eliminates shrinking or tapering of the finished hole and cuts costly rejects and scrap. Freer cutting action permits more speed and a sustained production job. Madison reamers produce a mirror-smooth finish in one operation, often eliminating the need for additional finishing. Because Madisons are pre-sized, they are easily interchangeable in Madison bars. A sharp cutter can be inserted in a Madison bar in a matter of seconds without disturbing the original set-up. Thus, a sharp cutter can be kept in operation at all times, assuring uniform work and the holding of required tolerances. Madison's one-screw adjustment feature, which controls both blades, permits expansion to make up for wear and regrinding and prevents the possibility of an off-center adjustment. Madison's controlled float feature eliminates possibility of misalignment errors, since float is controlled right at the point where the cutting action takes place. Only the cutter floats — not the bar. No special floating tool holders required with Madisons.

To better solve your reaming problems and to attain rock-bottom cutting costs — specify Madisons for all future reaming operations.

Write for the new Madison catalog. Full information about types, sizes and use of Madison reamers.



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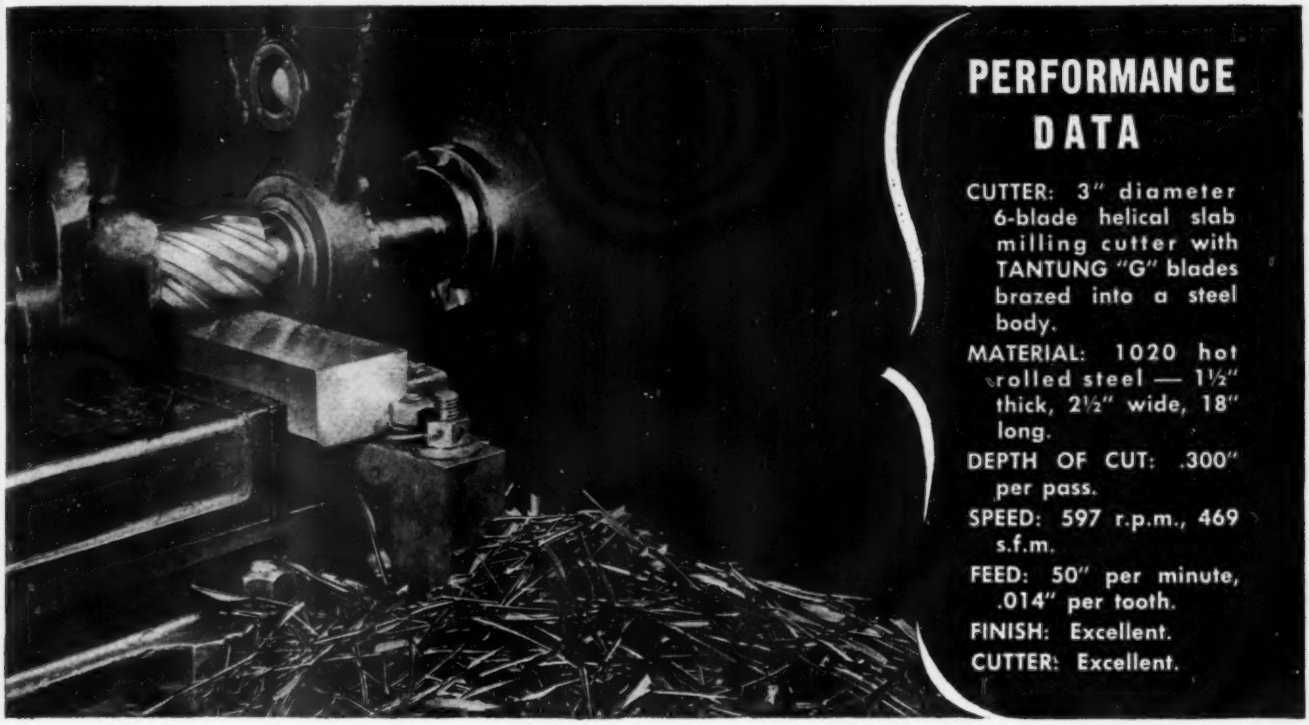

PERFORMANCE DATA

CUTTER: 3" diameter 6-blade helical slab milling cutter with TANTUNG "G" blades brazed into a steel body.

MATERIAL: 1020 hot rolled steel — 1½" thick, 2½" wide, 18" long.

DEPTH OF CUT: .300" per pass.

SPEED: 597 r.p.m., 469 s.f.m.

FEED: 50" per minute, .014" per tooth.

FINISH: Excellent.

CUTTER: Excellent.

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- This helical slab mill with six TANTUNG blades, brazed to an ordinary steel body, is removing metal at a rate of speed 300 to 400 per cent greater than has ever been possible with steel cutters.
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TOOL USERS . . .

The TANTUNG slab mill shown in this picture will be available through leading milling cutter manufacturers, whose names will be furnished upon request.

TANTUNG Rotary Files, Drills, Gages, End Mills and Milling Cutter Blades are obtainable from leading tool manufacturers.

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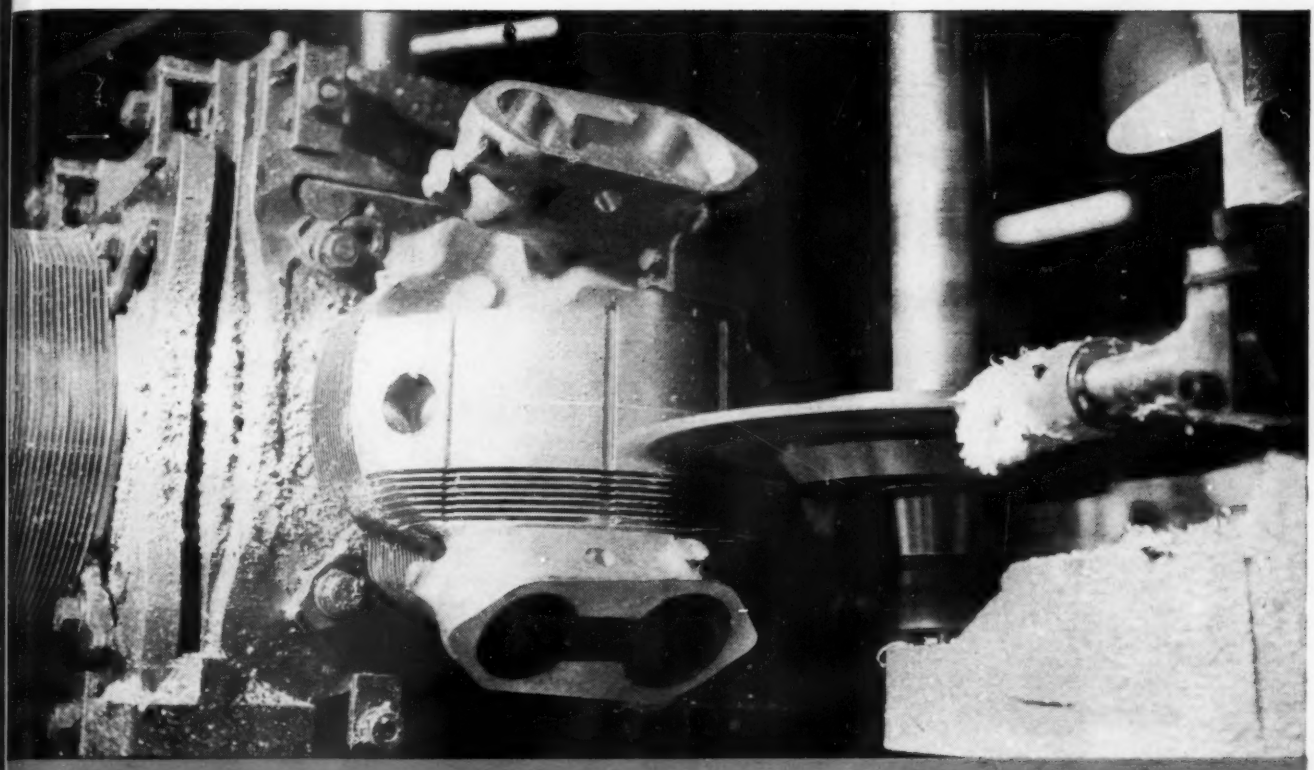

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HOW A DISSTONEER SOLVED A TOUGH MILLING PROBLEM BY THE DEVELOPMENT OF A SPECIALLY DESIGNED SAW . . . . . .

In order to gain increased cylinder head strength, a leading manufacturer of aircraft engines changed from cast aluminum to forged aluminum alloy. Milling of the 1/16" fins presented a difficult problem. It was an operation which, according to the manufacturer, "represents a revolutionary new technique," for the cutting speeds approach those of wood-working operations, speeds hitherto not attained in metal cutting.

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There are Disston Carboloy-fitted Surfacing Knives . . . Tongue and Groove Cutters . . . Moulding and Shaper Knives . . . and Specially Formed Cutters. Each is recommended for use in the cutting of hardwoods of an abrasive nature. Supplied in sizes and patterns to meet many specifications. For increased production, greater economy and longer tool life, investigate the merits of Disston Carboloy-fitted Tools.

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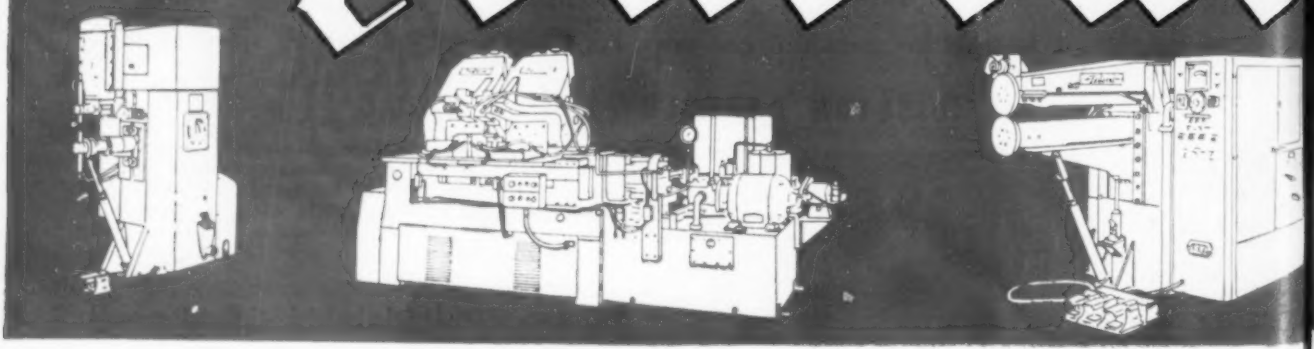
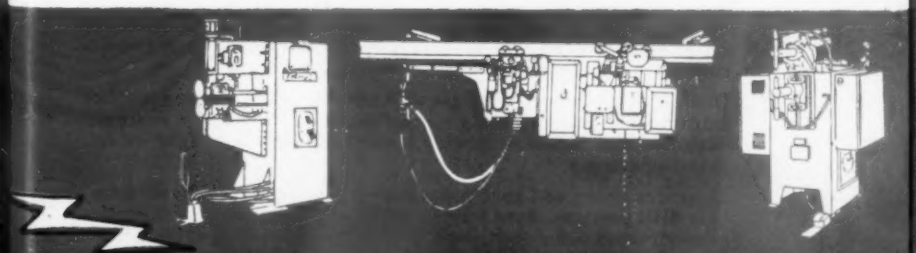


"...goods for the good of man"

This seems like a good time to be practical about New Year's Greetings to you who turned in such a tremendous job of production for war and now face the no less critical problem of producing of "goods for the good of man".

The most practical way we know to back up any wish for a happy and prosperous year is to re-state our ability and eagerness to provide means to improve production... tools that cut the corners of cost and time in metal fabrication... that is the sort of aid to happiness and prosperity on which we can personally deliver.

All of us, from the factories where Federal Resistance Welding Machinery is made, and from the many branch offices through which we wish to serve you, recognize the immensity of the challenge ahead. At the same time, we DO wish you a Happy New Year... practically *and* sentimentally.



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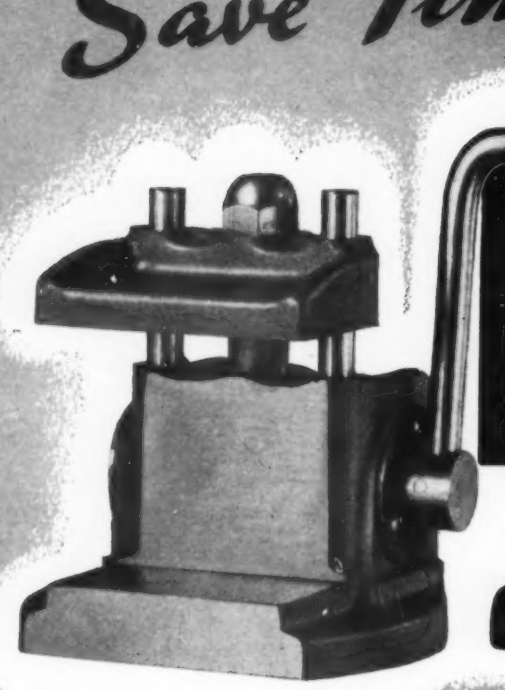

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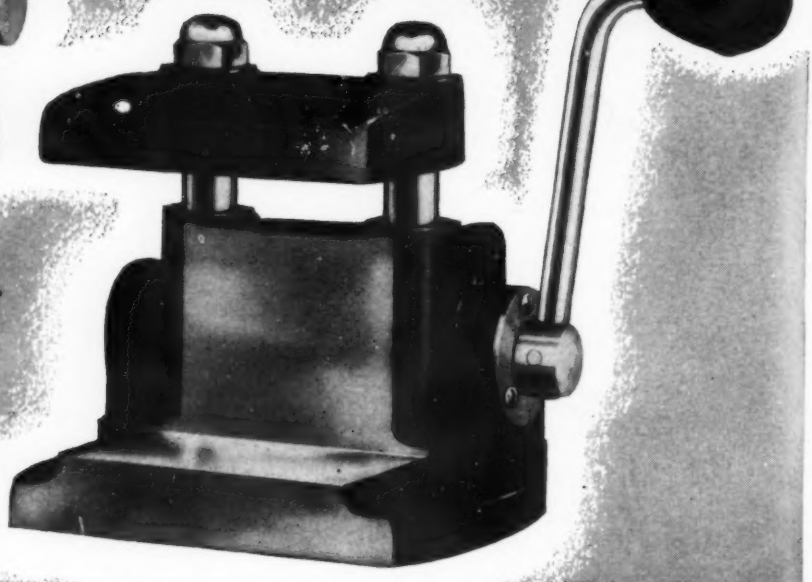

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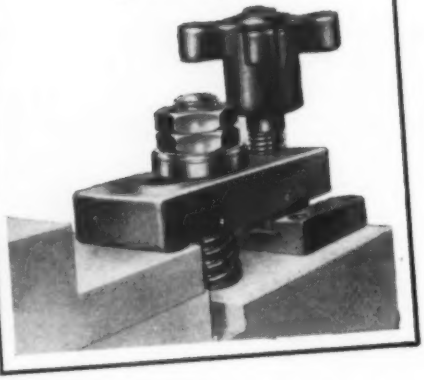

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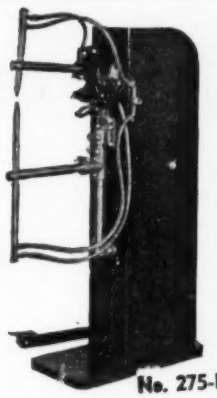

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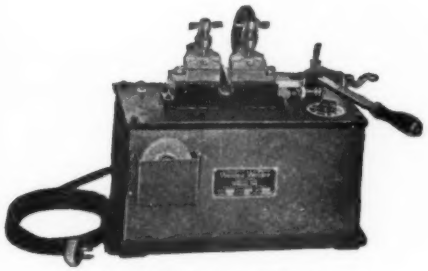

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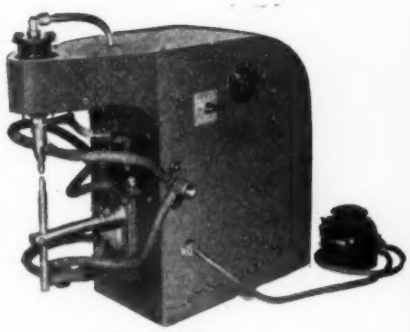

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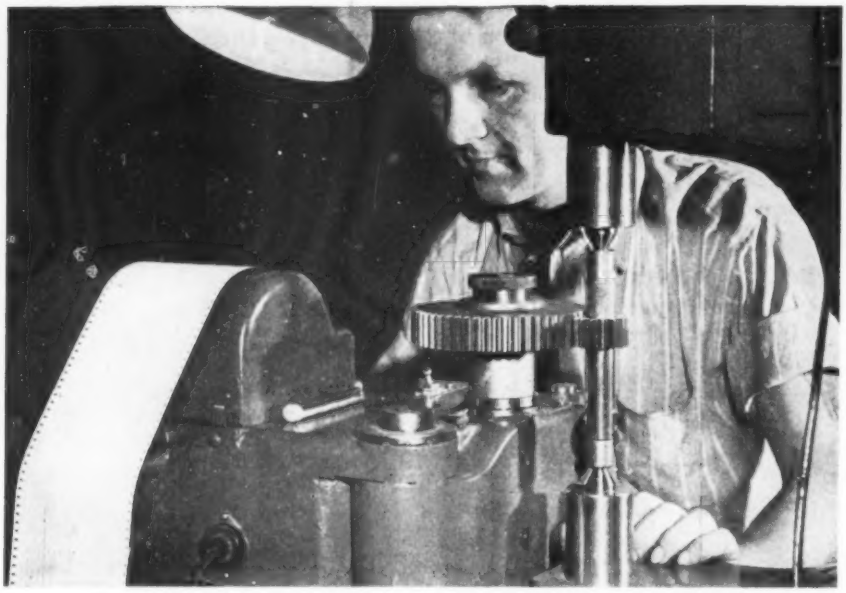

From Blueprint to Product

In the spectacular production of airplanes a vitally important phase is the manufacture of gears to tolerances hithero unattained. The tremendous speeds at which the gears operate make it essential that they be as nearly perfect as possible. While highly efficient manufacturing methods have been developed and are in use, it is still necessary to check each gear. Such characteristics as eccentricity, tooth profile, center distance and tooth spacing are checked by the use of master gears.

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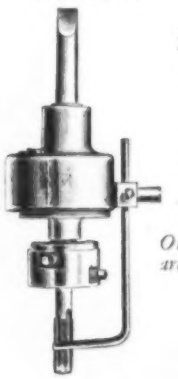

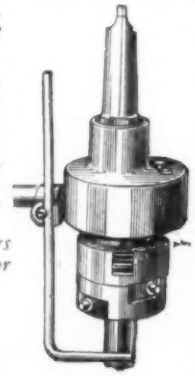

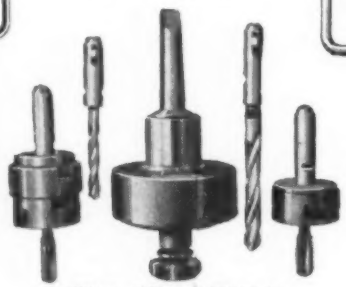

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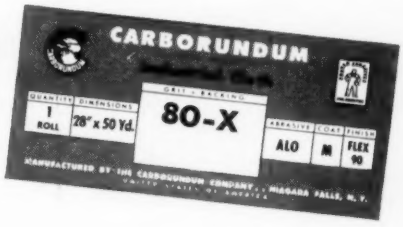

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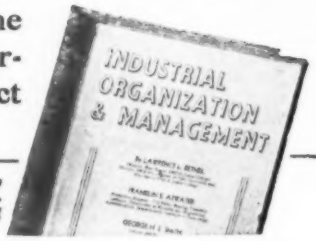

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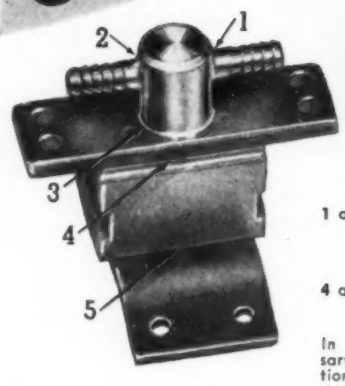

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3 Shows brazing of steel to steel by copper in furnace
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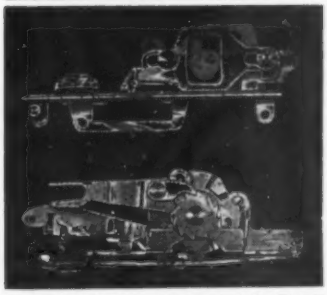

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MAN WANTED—Man experienced in etched name plate manufacture. In reply, give full particulars. P-488, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED ESTIMATOR and tool designer, experienced in the designing of jigs, fixtures, dies and special machinery. Also should be experienced and capable of estimating this type of manufacturing work. This position can be considered as permanent with an old well established tool plant, location Ohio. Should you have this ability and experience write, giving full background as to your experience, education, former positions held, compensation. P-516, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

ENGINE LATHE manufacturer requires the services of an experienced man to assume full charge of engineering and manufacturing operations. Please give complete information covering your experience, ability, and references. A fine opportunity for the right man. P-518. American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED: ASSISTANT Shop Superintendent with practical machine shop experience as a machine operator, knowledge of shop mathematics, layout and setup work. Requires knowledge of modern shop control, routing, operating methods, also methods of cutting metals and the supervision and direction of men. Location: Fox River Valley, Wisconsin. P-530, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PRODUCTION MANAGER: Under 50. Familiar with light steel fabrication and arc welding. Old established company in Southern States employing 700. Give fully age, experience, references, salary expected. P-531, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED: PRODUCTION Manager, Drop Forge Plant. Familiar with scheduling, planning, and production. Location East. Give full particulars, age, education, positions held, salaries earned, references, salary expected, enclose picture. P-532, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED
MECHANICAL ENGINEER

Shop and design experience on light precision machinery necessary. Product design, manufacturing and standardization of small parts preferred.

Permanent position in leading, fast-growing industry in southern New York State.

P-529, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED—MACHINE DESIGNER

Experienced on special or paper working machinery. Excellent opportunity for permanent position. Location Philadelphia area. Please give complete details, age, experience, etc.

P-500, AMERICAN MACHINIST
330 West 42nd St. New York 18, N. Y.

WANTED

Foreman for small Machine Shop located in Northwestern Pennsylvania. Must have had Machine Tool experience. Write giving age, experience, starting salary expected and when available.

P-527, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. Reconversion is creating lifetime opportunities now. This thoroughly organized confidential service of 35 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Delward Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

MANUFACTURING ENGINEER of precision machine manufacturing plant desires to make change by January 15th. Proved ability with methods, tool engineering, machine tools, jigs, fixtures. Has present contacts which represent $20,000,000 worth of machines and equipment to be placed for 1946 delivery. PW-533, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MANAGER HEAVY machinery, plate and structural work. Production, labor relations, engineering, sales. Resourceful, leader and organizer. Top record. Best references Engineering degree. Age 39. PW-534, American Machinist, 330 W. 42nd St., New York 18, N. Y.

GENERAL MANAGER or principal operating executive. 17 years principal operating executive supervising activities of as many as 7000 in engineering, shop supervision, planning, procurement, personnel relations and at times jobbing sales. Most of this period as chief executive of subsidiary plants, headquarters located elsewhere. Enviable record for low manufacturing cost, good industrial relations and maintenance of a working team. Titles held: Vice President and Director. Average earnings $15,000. Age 52, B.S. Degree. PW-535, American Machinist, 330 W. 42nd St., New York 18, N. Y.

MASTER MECHANIC or power engineer. Twelve years experience maintenance and operation marine power plants including diesel. Unlimited marine license, pre-war. Engineer power plant casualty company, inspection power plant equipment. Now Naval Officer (Engineering) specialized in repair work, machine shop, foundry, metal fabrication and welding practice. Presently directing supervision three hundred men all crafts. Age thirty-one years. Excellent references. Available January 1946. Consider foreign assignment. PW-536, American Machinist, 68 Post Street, San Francisco 4, Cal.

(Continued from opposite page)

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To Industry we offer confidential Personnel Management Service on a fee or retainer basis.

CURT E. PATTON PERSONNEL ENGINEERS
53 W. Jackson Blvd. Chicago 4

POSITIONS WANTED

(Continued from opposite page)

FACTORY ENGINEERING: and general executive, 44 years of age. Positions held during 20 years include—works manager, chief engineer, ass't. chief engineer, production manager, tooling supt., chief tool designer, chief of planning and methods, research eng., etc. Equally experienced in sheet metal and machining or assembly as well as machine tool and special machinery design and manufacture. Desire position where experience and ability can be fully utilized so that salary commensurate with this wide experience can be paid. PW-538, American Machinist, 330 W. 42nd St., New York 18, N. Y.

CHIEF DRAFTSMAN: Machine designer desires full or part time work in Chicago area. 25 years' experience on small, medium and heavy automatic machinery, tools, machine tools, electric and hydraulic devices. T. Mueller, 1613 S. Central Ave., Chicago 50, Ill.

CHIEF ENGINEER: or position where vast experience in designing and tooling special machines for wire, metal, etc. and machine tools, could be used to best advantage. PW-539, American Machinist, 330 W. 42nd St., New York 18, N. Y.

GRADUATE MECHANICAL Engineer, age 29, desires "career" position in design, product development, or project engineering. Offers 7½ years experience. Now in responsible supervisory position requiring creation, design and production liaison of precision equipment for hydraulic division of company employing approximately 2500 people. Unusual educational background including Tau Beta Pi membership. PW-540, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WORKS MANAGER, plant manager, general supt. Technically trained mechanical and industrial engineer. 24 years manufacturing light and heavy precision machine tools, diesel engine and aviation specialties, electric motor and equipment for leading companies. 8 years engineering capacities, 16 years in charge of manufacturing. An inherent mechanic and engineer experience in using modern methods, machines, tools, and systems in all manufacturing department from purchase of material to shipment of product. Jobbing lots and line production. Good records for results in increasing production, reducing costs, efficient organizations and handling of labor relations. 44 years old. Immediately available. PW-541, American Machinist, 330 W. 42nd St., New York 18, N. Y.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 458, 815-15th St., N.W., Washington 5, D.C.

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SALESMAN WANTED: by manufacturer of small flat and coil springs, wire formings and metal stampings. All territories except New York City and New England open. 10% straight commission basis. Precision manufacturer. Write The Hurley Manufacturing Company, Winsted, Connecticut.

Notice to Advertisers

Because of the New Year Holidays, December 29th to January 1st, the "Searchlight" pages of the

January 3rd Issue of

AMERICAN MACHINIST

Close for press earlier than the usual weekly closing time.

The cooperation of advertisers is solicited in forwarding new copy, or changes of copy, to reach us accordingly.

FINAL CLOSING TIME

Display and Undisplayed Ads
Tuesday, December 18th

SELLING OPPORTUNITY WANTED

MANUFACTURER'S AGENT: Western New York. Available in this territory to represent manufacturer of industrial or automotive equipment. Experienced chief engineer and executive with background and knowledge of sales, manufacture, design, materials, forgings, castings, engines and accessories, power transmissions and clutches, controls, instruments and lubrication, plans to open office. RA-542, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALES ENGINEER: Experienced in machine tool design and plant maintenance. Has sales experience and has held responsible industrial positions. Recently discharged U. S. Army Air Corps Major. Interested in industrial sales, particularly machine tools. SA-537, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED

SALES ENGINEER

Knowledge of Gears and Gear Application essential. Reply giving age, experience and salary expected.

GRANT GEAR WORKS, INC.
154 WEST SECOND ST., S. BOSTON

AVAILABLE
PLANT SUPERVISOR
OR SALES ENGINEER

Mechanical Engineering and Business Administration Degree. Four years machine tool industry-tool design, sales engineer machine tools, sales and service. Five years plant work national Armory high production metal working. Includes production control, plant layout, methods analysis, job evaluation, personnel interviews, and full charge Master Mechanics Section including jigs, fixtures, tools and dies, machine tool electrical control, hydraulics and practical quality control work. Age 31. Equivalent industrial age 35. References excellent. Please state minimum salary.

SA-524, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED — FIRST CLASS CUTTER LINE for Western Ohio and Indiana or either.

RA-508, AMERICAN MACHINIST
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FIRST CLASS BROACH LINE WANTED for Indiana, Western Ohio or either.

RA-507, AMERICAN MACHINIST
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Used 12" Gang Slitter with Motor Drive and Starter. Equipment must be in good condition. Quote price to

BASSICK-SACK DIVISION
Walker Road Winston-Salem, N. C.

WANTED

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To represent a modern gear manufacturing plant. Must have a degree in mechanical engineering as well as extensive selling experience in the gear industry. Write full details including name of university and year graduated; names and addresses of former employers; salary and territory desired and other pertinent details.

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Additional Contract Work Ads on pages 318 & 319

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PRECISION MACHINE PARTS.
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MILLING AND DRILLING

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Send your blue prints and samples for prompt quotations on work done on our wire feed screw machines (⅛" to ⅝" capacity), drill press or lathe.

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SEND B.P. FOR
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Tool—Jigs—Dies
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MUST BE SOLD BEFORE JANUARY 1st

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5—LEBLOND geared head LATHES, 25" x 40' x 47'6" and 25" x 24' x 27'6", will swing 30½", "N" series machines, motorized with extra attachments and tapers (NEW 1943).
4—LIBBY IH-6-FC LATHES, motorized standard equipment (NEW 1943)
2—LIPE "carbomatic" LATHES, motorized, standard equipment (NEW 1943)
2—HAMMOND "OD" FINISHING GRINDERS, motorized (NEW 1943)
10—NEBEL, HENDEY, NILES and WOLCOTT ENGINE LATHES
15—TOOL, PRODUCTION and CUTTER GRINDERS
3—BAKER HEAVY DUTY DRILLS, motor driven

Also welders, centering machines, slabmiller, Detrex degreasers, Una welder, sandblast unit, shop equipment, small tools, and numerous other items.

Write for quotations and descriptive circular.

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Excello #215A Double-end hydraulic precision boring machine with four DB-22 heads. Machine new in 1943, and is in first class condition. Motor voltage 220/440, 3 phase 60 cycle. Price $3800.00 F.O.B. Watertown, Mass. Machine can be inspected under power.

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1 Dill 24" Slotter
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Will sacrifice for quick sale

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NEW and USED—Hand and Power Brakes, Shears, Forming Rolls, Folders, Punches, Rotary Machines, Stakes, Spot and Arc Welders

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1—6"x20" PRATT & WHITNEY MODEL C THREAD MILLER
New February 1945, with motor drive

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EVERY ITEM GUARANTEED AS REPRESENTED

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6—#61 New Britain-Gridley 6 Spindle 1⅝" cap. Automatic Screw Machines. A.C. Motor Drive, Threading Spindle.

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle.

1—#515 National Acme 1⅝" 4-spindle Automatics, complete.

2—#55 National Acme 1⅝" 4-spindle Automatics, complete.

1—#2G Brown & Sharpe Automatic.

1—#1 Brown & Sharpe Automatic, old style.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36.

42" Bullard Vertical Boring Mill with side head; New Era Type.

#31 Lucas Horizontal Boring Mill, 3" bar.

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 M. T.

Avey, 2 & 3 spindle Prentice, 4 spindle.

Henry & Wright, 6 spindle, #2 M. T.

Woodward & Rogers, 6 spindle, #2 M. T.

Fosdick 13" Super speed 4-spindle drills.

Natco #12, 12 spindle #1 M. T.

RADIAL DRILLS

3' 9" column Cincinnati-Bickford.

3' 9" col. American, S.P.D.

3' Dreses, 10" rd. col. QCG., M.D.

3' Fosdick 10" Col. Motor Drive.

5' Arm 13" Rd. Col. Cinn. Bick, air clamp.

GRINDERS

12" No. 22 Heald Rotary Surface Grinder.

16" Persons-Arter Rotary Surface Grinder.

#4 Brown & Sharpe Universal Grinder.

#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.

Oliver Model 51 Drill Grinder; 1½" cap.

6"x32" Norton Cyl., overhead c/s drive.

#2 Brown & Sharpe Surface Grinder.

#70 Heald Internal Grinder.

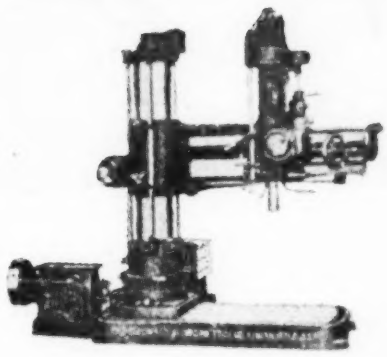
#60 Heald Cylinder Grinder.

3—#2 Cincinnati Centerless Grinders.

1—4x12 Landis Hydraulic Cylindrical Grinder, New.

Blanchard Grinder #16, 30" dia. Magnetic Chuck, 25 HP 3-60-440 V. Motor.

Pratt & Whitney Vertical Surface Grinder, 14"x36" with 10"x36" Magnetic Chuck. Ball Bearing Spindle. Perfect Condition.



Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

LATHES

14x6 Pratt & Whitney semi—Q.C.G.

16" Warner & Swasey Fox Brass (2).

16" Dreses Fox Brass.

Putnam 26x12 Heavy Q.C.G., arr. for M.D.

Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).

14x6 Hendey Toolroom Lathe, G. H., M.D.

14x8 LeBlond Toolroom Lathe, cone drive.

14"x6' Hendey 12-speed geared head.

14"x102" centers Hendey Lathe, M.D.

20"x10' Hendey.

16"x8' Rockford Tool Room Lathe, taper, collets.

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D.

No. 0 Bickett Vertical Bench Miller.

#1-#1½-#2 Brown & Sharpe Plain Miller.

P & W 2½" Duplex Spline Miller.

Hall Planetary Thread Miller 24".

#8 Lees Bradner Thread Miller.

#1, #2, #3 Kempsmith Plain Millers.

#2½, #3 LeBlond Universal.

PLANERS

30"x30"x10' Cinn. Heavy Pattern, 2 Hds.

20"x20"x24" N.-B.-P., Planer Shaper, M.D.

24"x24"x6' Cincinnati, 2 heads, M.D.

POWER PRESS HEADQUARTERS

#4½ Bliss D.C., B.G. Forging 3" stroke.

200 ton A.C.F. Hydraulic Press. Bed 24"x36", 4-post.

7—25 ton Model SL2 K.R. Wilson hydraulic Presses.

Beck Duplex Embossing Press.

75 ton H.P.M. 2 post, Hydraulic Press.

#1 Bliss Straight Side, double action, Cam Press. Will draw and lift out 2¾".

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12" Schuchart & Schutte Gear Hobber.

#1 Adams Gear Hobbers, Belt driven (3).

16" Smith & Mills.

21" Smith & Mills B.G. Helical Gears.

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Lennox Splitting Shear, ¾" cap.; 8' throat.

Lennox Bevel Shear, ¾" cap.

Bliss #232 Slitting Shear, 14 ga.

Gould & Eberhardt Slitting Shear, 10 ga.

Niagara #272 Power Squaring Shear.

Niagara #95 Power Seamer.

Niagara 3"x36" Geared Slip Roll Former.

Niagara 48" Roller Leveller, 6 Rolls.

Cleveland 8'x⅜ Power Squaring Shear, 24" gap, Motor drive.

MISCELLANEOUS

Waterbury-Farrel Cold Header, double stroke, open dia, ½" cap. & 6".

Manville Cold Header, single stroke, solid die, 3/16" cap.

Lacquer Heater Tank with acquistat. 150 ga.

Heat Treating Furnaces for the tool room.

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Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.

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#5B High Speed Riveting Hammer.

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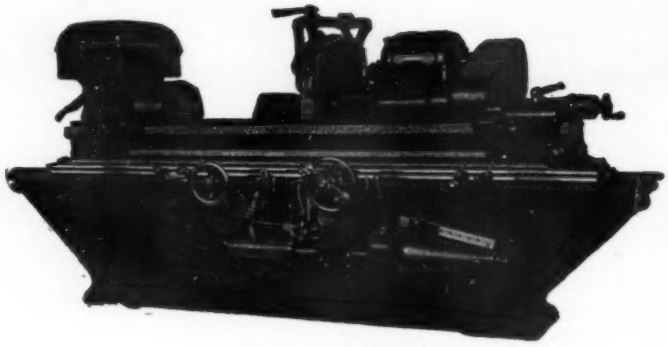

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10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
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LATEST TYPE TIMKEN BEARING MOTOR DRIVEN *MACHINE TOOLS*
ALL PRACTICALLY NEW — BUILT AFTER 1940

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BROWNE & SHARPE, No. 2, No. 2B Plain
BROWN & SHARPE, No. 10, No. 12 Automatic Plain
KEARNEY & TRECKER, No. 1218 Simplex Auto.
PRATT & WHITNEY, Model C 6x20" Thread
LEES BRADNER, No. LT Thread

TURRET LATHES

WARNER & SWASEY, No. 3, No. 4 Universal
WARNER & SWASEY, No. 1A, No. 2A

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BROWN & SHARPE, No. 0 3/8" cap. } Wire Feed
BROWN & SHARPE, No. 1 5/8" cap. }
BROWN & SHARPE, No. 2 1" cap. }

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BROWN & SHARPE No. 2B Surface
PRATT & WHITNEY 14x60" Ver. Surface
BLANCHARD, No. 18 Surface
BROWN & SHARPE No. 5, No. 23 Plain Cyl.
LANDIS Type H, 4x18" Hyd. Plain
LANDIS Type C, 10x48" Hyd. Plain
BROWN & SHARPE, No. 1, No. 2 Universal
LeBLOND, No. 2 Univ. Tool & Cutter
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PRATT & WHITNEY Contour

DRILL PRESSES—High Speed

ALLEN bench type HMDV
ALLEN single spindle
ALLEN 2-spindle
ALLEN 3-spindle
ALLEN 5-spindle

DRILLING MACHINES—Deep Hole

PRATT & WHITNEY 2-spindle

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GREENERD No. 3½, 5 Arbor
WATSON STILLMAN Hyd. Straightening
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BILLINGS & SPENCER Mod. "D" 1200# cap.
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and MANY OTHERS

YOUR OPPORTUNITY TO OBTAIN LATEST TYPE NEARLY NEW MACHINE TOOLS AT LOW PRICES — ACT QUICKLY!

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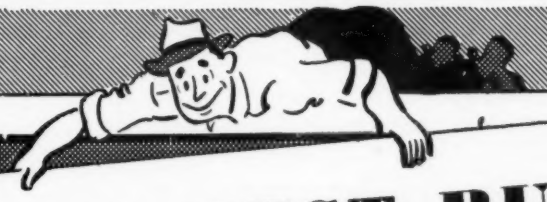

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BORING MILLS

24" BULLARD New Era Vertical with one swiveling turret head and one side head. AC or DC motor drive.

42" BULLARD New Era Vertical with one swiveling turret head and one side head. AC or DC motor drive.

NO. 1 PUTNAM Vertical Car Wheel Boring Mill with side head for hub facing and hoist. AC or DC motor drive.

100" NILES-BEMENT-POND Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

120" BETTS Heavy Vertical with two swiveling heads, Power Rapid Traverse, AC or DC motor drive.

120" NILES-BEMENT-POND Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

120" CINCINNATI Massive Pattern Vertical with two swiveling heads, Power Rapid Traverse. AC or DC motor drive.

2½" BAR CLEVELAND Horizontal Boring, Milling and Drilling Machine, Table type, all Geared Power Feeds, AC or DC.

NO. 32 3¼" Bar LUCAS Horizontal Table Type Boring, Drilling, and Milling Machine, Power Rapid Traverse. AC or DC motor drive.

4½" Bar NILES-BEMENT-POND Horizontal table type boring, drilling and milling machine, all geared feeds, AC or DC dr.

NO. 1 4" Bar DETRICK and HARVEY Floor Type Horizontal Boring, Drilling and Milling Machine, AC or DC.

5½" Bar NILES-BEMENT-POND Heavy floor Type Horizontal Boring, Drilling, Milling Machine. AC or DC motor drive.

RADIAL DRILLS

4' AMERICAN Plain Triple Purpose Enclosed Head, Drill with Tapping Attachment. Single Pulley Belt Drive or AC or DC.

5½' AMERICAN Full Universal Triple Geared with tapping attachment. Single pulley belt drive or AC or DC motor dr.

6' CARLTON Plain 15" round column with DC motor on arm, tapping attachment.

8' NILES-BEMENT-POND "Right Line" Plain with 230 volt DC motor on arm, tapping attachment.

GRINDERS

NO. 2 CINCINNATI Centerless Grinder.

12" O.S. WALKER Single Stroke Surface Grinder with 12" dia. magnetic chuck and 7½ HP, AC or DC motor.

NO. 16 BLANCHARD High Power Vertical Surface Grinder with 26" magnetic chuck and 20 HP, AC or DC motor.

LATHES

36"x30' LODGE & SHIPLEY, 18 Speed, Geared Head Screw, Cutting Engine Lathes with two carriages. AC or DC.

30"x34' LEBLOND Boring Lathe, geared heads, quick change gear. AC or DC.

42"x36' PUTNAM Geared Head, 25' between centers. Quick change gear box. AC or DC motor drive.

48"x20' NILES-BEMENT-POND Extra Heavy Geared Head, 11'5" between centers. Power cross and angular feed to compound rest. Semi-quick change gear, taper attachment.

48"x30' BRIDGEFORD 9 speed geared head, 20' between centers. Triple geared internal face plate drive. AC or DC.

48"x59' BRIDGEFORD Boring and Turning with 9 speed geared headstock, turning carriage with compound rest, AC or DC motor drive.

NO. 4 PUTNAM Extra Heavy Center Drive Axle Turning Lathe with two carriages. AC or DC motor drive.

42" PUTNAM Heavy Double End Car wheel lathe. Equipped with overhead hoist for loading wheels and axles.

MILLERS

NO. 3B BROWN & SHARPE Plain with double overarm table 14"x60" with 7½ HP, AC or DC motor.

NO. 4 CINCINNATI High Power Plain. Power rapid traverse table 16½"x64". Single pulley belt drive or AC or DC.

NO. 4 CINCINNATI High Power Vertical, Power rapid traverse. Table 16½"x64". Single pulley belt drive.

24"x24"x12' INGERSOLL Horizontal Spindle Slab Miller with adjustable rail.

24"x24"x12' INGERSOLL Planer Type milling machine with one head on adjustable rail and two side heads, AC or DC motor drive.

48"x48"x16' INGERSOLL Planer Miller with 2 heads on adjustable rail and 2 side heads. AC or DC motor.

PLANERS

36"x36"x12' CINCINNATI Standard Planer with two heads on rail, power elevation to rail. AC or DC.

38"x38"x14' OHIO Heavy with two heads on rail and one side head. 230V DC reversing type planer motor and control.

48"x48"x15' NILES - BEMENT - POND Heavy with two heads on rail and two side heads. 230V DC reversing type planer motor and control.

48"x48"x24' NILES - BEMENT - POND Heavy with two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.

48"x48"x32' G. A. GRAY Spiral Drive with two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.

72"x72"x18' NILES - BEMENT - POND Heavy, two heads on rail and two side heads. 230 Volt DC reversing type planer motor and control.

84" WIDENED TO 98"x32"x42' SOUTHWARK Extra Heavy, two rail heads and two side heads. 230 Volt DC reversing type planer motor and control.

16'x10'x30' BETTS heavy, two heads on rail and two side heads, forced feed lubrication. 230 Volt DC reversing type planer motor and control.

SLOTTERS

6" PRATT & WHITNEY Vertical Shaper with 20" rotary table power feeds, tilting ram, AC or DC.

15" NEWTON Crank Slotter, 30" circular table, AC or DC.

15" NILES-BEMENT-POND, 30" circular table, AC or DC motor drive through gear box.

20" SELLERS Crank Slotter, 48" circular table, AC or DC.

MISCELLANEOUS

30' NO. 3 HILLES JONES Plate Edge Planer.

30'x⅞" NILES-BEMENT-POND Plate Bending Rolls, pyramid type.

26"x10' LIBBY Turret Lathe with 7½" hole through spindle pan bed. Power Rapid Traverse. AC or DC.

SIMMONS MACHINE TOOL CORPORATION

Main Office & Plant: 1759 N. Broadway, Albany 1, N. Y. **New York Office: 50 E. 42nd St.**

QUALITY *Machine Tools*

NOW IN STOCK

No. 7-1 CLEVELAND SINGLE GEARED PRESS, 6" stroke, bed size 18" x 30", equipped with eight station dial feed, m.d. with controls.
No. 3 LONG AND ALLSTATTER MULTIPLE PUNCH, 56" between housings, 2½" stroke, motor driven with motor and controls.

AUTOMATICS

No. 61 1⅝" New Britain, six spindle.
16" x 33" Fay, with air chuck.

DRILLS

★ **4 Ft. Canedy-Otto Radial Drill, motor spindle, 11" column, new in 1942.**
No. 416 Baker, single spindle.
★ **21" Cincinnati-Bickford Direct Motor Driven Drill, single spindle.**
42" Barnes, sliding head.
Allen Sensitive Drill, four spindle.
No. 11 Natco Multiple Drill, 16 spindle.
★ **No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".**

GEAR CUTTERS

★ **No. 7, 71A, 715A Fellows Gear Shapers, all manufactured in 1936, with spur or helical guides, motor driven.**
No. 6 Fellows Gear Shaper, m.d.
★ **96" Gleason Spur & Bevel Gear Planer.**
No. 12 Barber Colman Gear Hobber.
No. 5—48" Cincinnati Automatic Gear Cutter.

GRINDERS

No. 22 Heald Rotary Surface.
76" Rogers Knife Grinder, type B.
No. 16-26" and No. 16-30" Blanchard Surface Grinder.
No. 72A3 Heald Gagematic Internal Grinder.
No. 70 and 75 Heald Internal Grinders.
No. 13 Brown & Sharpe Universal & Tool Grinder.
10" x 36" Norton Cylindrical Grinder.
11" x 72" Brown & Sharpe Cylindrical.
No. 2 Cincinnati Centerless.
★ **No. 3 Cincinnati Centerless Grinder, m.d.**

LATHES, ENGINE

★ **20" x 8' Sidney "Monotrol", 8 speed geared head, with taper attachment.**
24" x 30' Lodge & Shipley, g.h.
★ **18" x 8' American, 8 speed geared head.**
16" x 6' Pratt & Whitney, c.d., with relieving attachment.
★ **8" x 60" Fitchburg Lo-Swing, g.h.**

LATHES, TURRET

★ **No. 4L Gisholt, 9¼" spindle, chucking.**
No. 1A, 2A, 3A Warner & Swasey.
2¼" x 24" Jones & Lamson, chucking, serial 40269.
★ **No. 6D Potter & Johnston Automatic Chucking and Turning Machine.**
No. 5A and No. 6A Potter & Johnston.
No. 2 Warner & Swasey, g.h.
No. 3 Gisholt, g.h.
★ **42" Bullard VTL, New Era type.**

MILLS

No. 3B Milwaukee Plain, m.d.
No. 4 LeBlonde Plain, c.d.
No. 1A Milwaukee Plain, s.p.d.
No. 0-8 Cincinnati Plain Automatic, m.d.
18" Cincinnati Plain Mfg., s.p.d.
★ **3" Universal Horizontal Boring, m.d.**
6" x 14", 6" x 48", P. & W. Thread Mill.
4" Pratt & Whitney Spline Mill.
42" Bullard Vertical Boring Mill.

MISCELLANEOUS

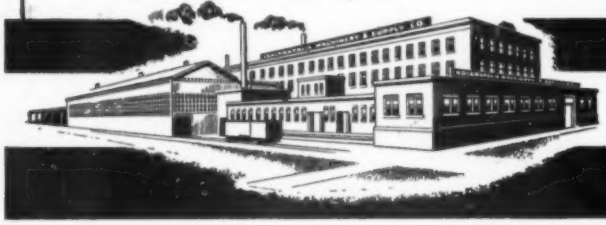
Schraner Crankshaft Lapping Machine, Model B.
8" x 7" Troy Vertical Steam Engine.
No. 6 Whiting Stake Riveter.

PLANERS AND SHAPERS

36" x 36" x 10' Woodward & Powell Planer, 2 heads.
12" Smith & Mills Crank Shaper, s.p.d.
★ **6" Pratt & Whitney Vertical Shaper.**
4" Stevens Vertical Slotter, m.d.

SAWS

No. 4B Marvel Hack Saw.
9" x 9" Peerless Hydraulic



INDIANAPOLIS MACHINERY & SUPPLY CO., INC.

1961 S. Meridian St., Indianapolis 6, Indiana

EASTERN BRANCH: 44 WHITEHALL ST., NEW YORK
MEXICO OFFICE: Balderas No. 31, Desp. 102, MEXICO, D. F.

HEAVY DUTY MACHINE TOOLS PRICED TO MOVE

LESS THAN FIVE YEARS OLD. READY TO GO TO WORK.

1—#36 Van Norman Vertical, A.C. M.D. New in 1942.
1—24" x 240" Norton Type C. Plain Cylindrical A.C. M.D.
1—3½ Cincinnati Gilbert Horizontal Boring Mill New in 1941.
7—#0-8 Cincinnati Plain Automatic Millers, Rise & Fall, Motors.
1—10" x 72" Norton Type C Plain Hydraulic Grinders, A.C. Motor Drive.
1—#4L LaPointe Hydraulic Broach, A.C. Motor drive, Outboard support.
3—#2-20 Kent Owens Hydraulic Milling Machines, A.C. Motor drive.
3—#2 Sundstrand 24" Electo Mills, A.C. Motor drive.
2—#3A Warner & Swasey, Taper, Threading Etc. Serial 649000 A.C. M.D.
1—#4A Warner & Swasey, Threading, Chuck. Serial 649000 A.C. Motor.
1—#28/60 Cincinnati Hydrotel Vertical Milling Machine. #5 Reed Prentice Vertical Milling Machine. A. C. M. D.

BORING MILLS

36" & 42" Bullard New Era Vertical Turret Lathes, A.C. M.D.
12' Niles Bement Pond Vertical Boring Mill, 2 Heads, Geared Feeds. D.C. Drive.
42' Niles 2 Head Boring Mill, reasonably priced.

LATHES

24" x 14' Lodge & Shipley Sel. Grd. Hd. S.P.D:
27" x 16' Lodge & Shipley Geared Head, A.C. M.D. Taper
36" x 30' Lodge & Shipley Geared Head, Two Carriages, Q.C.
16" x 8' Reed Prentice Timken Bearings. A.C. M.D. Taper.
20" x 10' Lodge & Shipley 3 S.C.D. M.D. Q.C.

MILLING MACHINES

#3 Cincinnati Vertical H.P. S.P.D.
#4 Cincinnati High Power, A.C. M.D. Rapid Traverse, Vertical.
#5 Cincinnati Rect. Overarm, Rapid Traverse, S.P.D.
#2 American Plain Milling Machine. A.C. M.D.

GRINDERS

16" x 50" Hill Clarke, A.C. M.D.
18" x 85" Landis Crankshaft.
16" x 24" x 96" Mattison Hydraulic Surface Grinders, A.C M.D.

PLANERS

60" x 48" x 24' American, 4 Heads.
24" x 24" x 10' Powell Planer, 2 Heads.
56" x 56" x 36' Cincinnati, 4 heads.

CINCINNATI MACHINERY & SUPPLY CO.

217 EAST SECOND STREET **CINCINNATI, OHIO**

EASTERN OFFERS FROM STOCK

TURRET LATHES AND SCREW MACHINES

No. 2 Cincinnati Acme Full Universal, m.d., cross sliding turret, Timken Bearings, covered ways, latest type
No. 2 Cincinnati Acme, as above, with fixed center turret
No. 3S Cincinnati Acme, as above, with fixed center turret
No. 2L Gisholt Universal, m.d., Timken Bearings, hardened ways, pre-selector head
No. 2 Pratt & Whitney Shaver, m.d.
No. 2B Foster Universal, m.d.
No. 3 Cincinnati Acme Full Universal, m.d.
No. 3A Warner & Swasey Universal Hollow Hex., m.d., bar
No. 3A Warner & Swasey, m.d., chucking
No. 3 Warner & Swasey Ram Type, m.d. in base, Timken, hardened ways, latest type
No. 4 Warner & Swasey Ram Type, as above
No. 5 Warner & Swasey Ram Type, as above
No. 4R Cincinnati Acme Ram Type, m.d. in base
No. 4 Warner & Swasey, cone
No. 4A Warner & Swasey Universal Hollow Hex., m.d., Timken Bearings, covered ways, chucking equip.
2½"x24" Jones & Lamson Geared Head, m.d., bar
3x36" Jones & Lamson Geared Head, md.., chucking
3x36" Jones & Lamson Geared Head, m.d., bar
2 spindle 3x36" Jones & Lamson Geared Head, m.d., chucking
3¼" Cincinnati Acme Geared Head Flat Turret, m.d.
3½x32" Jones & Lamson Geared Head Flat Turret, m.d., chucking
3½x32" Jones & Lamson Geared Head Flat Turret, m.d., bar
18" Libby Type A, m.d., chucking
20"x7' American Turret, cone
24" Gisholt, cone
24" Steinle, m.d.
26" Libby Type C, m.d., 7½" hole
26" Libby Type C, m.d., 4½" hole
26" Gisholt, cone
Woods Tilted Turret, model D, cone

SHEET METAL MACHINERY

No. 3 Gray Sheet Metal Cutter, 36" throat, ⅜" cap.
Southwark Rotary Metal Cutter, 36" throat, ⅜" cap.
8' Niles-Bement-Pond Flanger, ¼" cap.
McCabe Pneumatic Flanger, cap. ½" cold
No. 2 Campbell Nibbler, m.d., ⅜" cap.
Quickwork Rolling Machine, cap. 18 ga.

INTERNAL GRINDERS

No. 16-22" Bryant Hydraulic Hole, m.d., latest
No. 16RS Bryant, m.d., latest
No. 24-20" Bryant Hydraulic, m.d.
No. 6 Bryant, belt
No. 10 Bryant, belt
No. 20 Bryant, belt
No.72A3 Heald Gagematic, m.d.
No. 72A3 Heald Sizematic, m.d.

SURFACE GRINDERS

No. 2 Brown & Sharpe Automatic, m.d. in base, latest
No. 3 Gallmeyer & Livingston, m.d. in base, hydraulic
No. 18 Blanchard, 30" chuck, m.d., latest
No. 500—170" Hanchett Face, model MD, traveling head type, latest
14" Pratt & Whitney Vertical, m.d., ball bearing spindle
22" Pratt & Whitney Vertical Type B, m.d.
No. 33 Abrasive Vertical, m.d. in base
Builders Iron Fdry. Co. Surface, m.d.
36"x36"x12' Gray Planer Type, m.d.
54" Bridgeport Knife, belt
No. 76D Baldwin-Tuthill Knife, m.d.
No. 1 Fraser Lapper, 26" plate

HAMMERS

200 lb. Beaudry, m.d.
800 lb. Bement Single Frame Steam
1100 lb. Bement Miles Single Frame Steam

KEYSEATERS

No. 2 Morton, belt
30" stroke Morton, m.d.

PIPE MACHINES

2" Curtis & Curtis, belted m.d.
2" Bignall, cone
3" Jarecki, cone
4" Curtis & Curtis, belt
16" Cox, motorized

CYLINDRICAL GRINDERS—PLAIN

6x18" Landis Self-Contained, m.d.
6x32" Fitchburg Type A, m.d., latest
8x36" No. 12 Brown & Sharpe, belt
8x36" Cincinnati Saddle Type, m.d.
10x24" Landis Self-Contained, m.d.
10x36" Cincinnati Hydraulic, m.d., model EA
10x48" Brown & Sharpe, belt
10x48" Landis Type C Hydraulic, m.d., latest
10x72" Landis, m.d.
12x36" Cincinnati, belt
12x36" Landis, m.d.
12x36" Modern, belt
12x42" Landis, belt
12x48" Cincinnati Self-Contained, 3 m.d.
12x72" No. 16 Brown & Sharpe, belt
12x96" Landis, m.d.
14x18" Cincinnati, 3 m.d.
12x48" Modern, m.d.
14x48" Cincinnati Self-Contained, 3 m.d.
16x72" Landis, m.d.
16x216" Landis Type B Hydraulic, m.d.
20x120" Landis Self-Contained, m.d.
26x96" Landis Self-Contained, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d.
Cincinnati Valve Seat Grinder, m.d., cap. ⅜" valve stems

CYLINDER GRINDERS

No. 55 Heald, m.d.
No. 60 Heald, belt
No. 65 Heald, belt

UNIVERSAL CYLINDRICAL GRINDERS

No. 2—12x30" Brown & Sharpe, belt
12x36" Cincinnati, belt
16x68" Landis, belt

DISC GRINDERS

No. 4 Gardner, m.d.
No. 20 Gardner, B.B.B. Combination Disc Grinder and Roll Sander

TOOL & CUTTER GRINDERS

Type 05D Sellers Drill Grinder, m.d.
No. 2 Cincinnati Plain Cutter & Tool, m.d., latest
No. 2 Cincinnati Universal, m.d., latest
No. 3 Gallmeyer & Livingston, m.d.
D6A Gallmeyer & Livingston Drill Grinder, m.d.

PLANERS

24"x24"x6' G. A. Gray, 1 head, belt
24"x24"x6' Pond, 1 head, belt
30"x30"x10' American, 1 head, belt
30"x30"x10' American, 2 heads, belt
30"x30"x14' G. A. Gray, 2 heads, belt
36"x36"x10' Niles, 2 heads, belt
36"x36"x12' Powell, 2 heads, m.d.
36"x36"x12' Woodward & Powell, 3 heads, m.d.
36"x36"x16' G. A. Gray, 2 heads, m.d.
36"x36"x18' Niles-Bement-Pond, reversing m.d. 2 heads
36"x36"x20' Cincinnati, 2 heads, belt
36"x36"x20' G. A. Gray, 2 heads, belt
36" widened to 44"x36"x20' G. A. Gray, reversing m.d., 2 heads
42"x42"x26' G. A. Gray, 2 heads, m.d.
48"x48"x10' Pond "Time Saver", 3 heads, reversing m.d.
48"x48"x18' Detrick & Harvey, reversing m.d., 4 heads
48"x48"x30' Cincinnati, 4 heads, m.d.
60"x60"x20' G. A. Gray, m.d., 4 heads
48"x48"x40' Sellers, 2 heads, reversing m.d.
50"x48"x32' Niles-Bement-Pond, 4 heads, reversing m.d.
66"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x24' Niles-Bement-Pond, 4 heads, reversing m.d.
96"x72"x18' Pond, 4 heads, m.d.
120"x96"x20' Cincinnati, 4 heads, reversing m.d.

RIVETERS

No. 3A H.D. High Speed Riveting Hammer, m.d.
¼" Shuster Riveter, belt
Hanna Bench Type Punch Riveter, 8" throat
Chicago Pneumatic, 24" throat

SAWS

V26 Continental Do-All Contour Shaping Machine, m.d.
No. 3 and 8 Nutter & Barnes Cold Saws
No. 3 and 8 Nutter & Barnes Cold Saws
No. 11½ Higley Cold Saw
No. 15 Lea-Simplex Cold Saw
No. 138 Espen-Lucas Cold Saw, m.d.

ROLLS

No. 3 Ajax Forging Rolls, m.d.
No. 4 Hilles & Jones Straightening Rolls, m.d.

SLOTTERS

10" Newton, cone
12" Bement-Miles, var. speed m.d.
15" Canada, m.d.
48" Niles-Bement-Pond Geared, var. speed m.d.
No. 1 National Acme Screw Slotter, belt

TAPPERS

6 spindle ½" Acme Semi-Automatic Nut, m.d., latest type
No. 1 Garvin Knee Type, belt
½" Rickert & Shaffer Vertical, belt
No. 5 Webster & Perks 5 spindle Vertical Nut, belt

MISCELLANEOUS

Gisholt Precision Balancing Machine, m.d.
Kerrick Cleaner, type LOES
No. 2 Cochran-Bly Filing Machine, belt
Magnaflux Inspection Machine
Detrick & Harvey 2 spindle Profiler, belt
No. 12M Morey 2 spindle Profiler, belt
No. 12M Morey 2 spindle Profiler, m.d., latest type
No. 11, 11S Cochran-Bly Saw Sharpeners
No. 1 Leighton Type Straightening Machine, m.d.
Wagner Saw Sharpener, belt
No. 1½A Standard Rotary Swaging Machine, m.d.

Partial Listing only. We carry a stock of more than 1200 machines.

THE EASTERN MACHINERY CO.

1004 TENNESSEE AVENUE **CINCINNATI 29, OHIO**

COMPLETE LIQUIDATION MACHINERY AND EQUIPMENT

ATLANTIC DIESEL CORP.

CODWISE AVENUE — **NEW BRUNSWICK, NEW JERSEY**

Machines new since 1942. Motor Driven.

GRINDERS

#2 Cincinnati Tool and Cutter Grinder
Model P-5 Norton Buraway Grinders
#2 Cincinnati Centerless Grinders
Two #3 Cincinnati Centerless Grinders
#72A3 Heald Sizematic Grinder
Two #72A5 Heald Internal Grinders
14" x 16" x 60" Mattison Surface Grinder
#6 Landis Thread Grinder

LATHES

One 20" x 9' LeBlond Geared Head Lathes
#12 Gisholt Hydraulic Production Lathe

MILLERS

Three #0 Sundstrand Type B. Rigidmils
Four #2-24 Cincinnati Plain Hydraulic Millers
One #2K Milwaukee Plain Millers
Two #1248S Milwaukee Simplex Millers
Four #2H Milwaukee Vertical Millers
#2K Milwaukee Vertical Millers
4½" x 36" Pratt & Whitney Thread Miller

TURRET LATHES

Two #3 Warner and Swasey Universal Geared Head Turret Lathes
Three #2F Foster Fastermatic Geared Head Turret Lathes
Nine #5U Foster Universal Geared Head Turret Lathes
Two #5 Jones & Lamson Universal Geared Head Turret Lathes
#8A Jones & Lamson Universal Geared Head Turret Lathe

MISCELLANEOUS

Two #401 Campbell Cutomatics
#425 Campbell Cutalator
40KW High Frequency Heating Unit
Anodizing Unit
#49 Heald Double End Borematic
Magnaflux Unit
Jones and Lamson Comparator

Large quantity of new tools. Machines may be inspected under power. Representative at plant Mondays through Fridays. Partial listing.

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200 H.P. Hor. 4 Pl. Motor Driven Pump. Capacity 78 G.P.M. 4000#
2300 Volt Synchronous Motor 3 Phase 60 Cycle
ALSO—75 H.P. Hor. 4 Pl. Pump—50 G.P.M.—2000#
50 H.P. Vert. Triplex Pump—24 G.P.M.—2500#
200 H.P. Horizontal 4 Pl. Pump—200 G.P.M.—1500#
18"x15' Accumulator 1500#
350 ton down moving ram hydraulic press 42" stroke, 28" between rods.
750 Ton Waterbury Farrell Lead Extrusion Press.

ACCUMULATORS, PRESSES, VALVES, ETC.

Specialists in Hydraulic Equipment

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UNUSUAL VALUES

Blueprint machine—3 pieces
Drill, high speed 7' overhang single spindle
Drill, 21" Royersford Bk Grd. Pr. Feed
Drill, two-spindle sensitive, #1 Morse taper
Drill, 4-spindle sensitive
Gear cutter, Brown & Sharpe #3—26
Gear cutter, Gould & Eberhardt 42"
Grinder, Webster and Perks #1-¾ motor drive
HackSaw, 12 x 12 Racine for Motor Drive
22" Buffalo Pr. Fd. Motor Drive
16" x 6' Hendey Lathe, Quick Change Gear
Pipe Machine, 8" Oster motor drive
Planer 24"x24"x6' Pease, motor drive
Punch & Shear, two ½" & ⅝" capacity
Shaper, 24" Gould & Eberhardt
Shaper, 16" Barker
Threading Machines, #0 Webster & Perks
Tool Grinder, Sellers new #0, #1 and #2 magic chuck and collets

THE OSBORNE & SEXTON MACHINERY CO.
COLUMBUS, OHIO

10" x 48" CINCINNATI MODEL ER PLAIN HYDRAULIC GRINDER

New November 1942. Filmatic bearings. Three motor drive.

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Your post war MACHINE TOOL and INDUSTRIAL EQUIPMENT needs can be solved

THIS SURPLUS EQUIPMENT is available through RFC

The first problem of reconversion facing private industry today is the problem of getting machines in motion as soon as possible.

The vast stock pile of government owned surplus tools of every description being released to industry can help you reconvert. It is the job of the Reconstruction Finance Corporation to dispose of this surplus property quickly and effectively. Toward that end we ask you to follow this simple 3 step procedure:

1. **Submit in writing your requirements for machine tools and industrial equipment to us now.**
2. **Send a typewritten list to your nearest R.F.C. Regional Office listed below.**
3. **Make your descriptions brief, one line if possible, clearly grouping various types of equipment you need.**

The supply of industrial equipment and machine tools is sufficient to meet most of the needs of industry . . . as this partial listing indicates. Our job is to get these tools in your hands as speedily and easily as possible. The 31 strategically located offices below are ready to help you reconvert.

A CHECK LIST OF SURPLUS INDUSTRIAL EQUIPMENT

AVAILABLE THROUGH RFC

Check the types of equipment on which you desire further and continuing information. Mail to your nearest RFC office listed below. Your name will be placed on our regular mailing list.

MACHINE TOOLS

- ☐ Boring Mills
- ☐ Broaching Machines
- ☐ Turret Lathes
- ☐ Drilling Machines
- ☐ Gear Cutting and Finishing
- ☐ Grinding Machines
- ☐ Lathes
- ☐ Milling Machines
- ☐ Shapers and Slotters

INDUSTRIAL EQUIPMENT

- ☐ Hydraulic Presses
- ☐ Woodworking Machinery
- ☐ Electric Welding Equipment (Arc or Resistance Types)
- ☐ Heat Treating Furnaces
- ☐ Inspection Testing and Measuring
- ☐ Conveyors
- ☐ Gas Welding and Cutting Equipment
- ☐ Engine Driven Generator Sets
- ☐ Process Control Recording Instruments
- ☐ Electrical Switch Gear
- ☐ Miscellaneous Metal Working Machinery

The following surplus equipment is also available in various makes and *LARGE QUANTITIES* . . .

- ☐ Ball and Roller Bearings
- ☐ Abrasives, Basic Products (Grinding Wheels)
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NAME.....

TITLE.....

COMPANY.....

ADDRESS.....

We want to make it easy to do business with RFC. If you desire, credit terms can be arranged. If your local office does not have all the equipment you need, they will endeavor to locate it from other offices throughout the country.

RECONSTRUCTION FINANCE CORPORATION

A Disposal Agency Designated by the Surplus Property Administration

Agencies located at: Atlanta • Birmingham • Boston • Charlotte • Chicago • Cleveland • Dallas • Denver Detroit • Helena • Houston • Jacksonville • Kansas City, Mo. • Little Rock • Los Angeles • Louisville Minneapolis • Nashville • New Orleans • New York • Oklahoma City • Omaha • Philadelphia Portland, Ore. • Richmond • St. Louis • Salt Lake City • San Antonio • San Francisco • Seattle • Spokane

130-T

MOREY DEPENDABLE USED MACHINERY

BORING MILLS — Vertical
BULLARD 24", 36", 42", N.E. Type—M.D.
GISHOLT 42"—2 heads
KING 72" Vert. 2 heads; M.D.

DRILL PRESSES
AVEY No. 3, single spindle
AVEY No. 2, 3-spindle
COLURN D-2 Upright
NATCO No. 12, multiple spindle

GEAR CUTTERS
BROWN & SHARPE No. 13
BROWN & SHARPE 60"x12" Spur Gear
FELLOWS No. 712
GOULD & EBERHARDT 36" Hobber

GEAR GENERATORS
GLEASON 3", 6", 12" Straight
GLEASON 10" and 15" Spiral
GLEASON 18" Bevel Gear

GRINDERS
NORTON 24"x240" Plain
ARTER 8" Rotary Surface
BLANCHARD #16 Vertical Surface
ARTER Automatic Piston Ring
UNIVERSAL Hydraulic Spline Shaft
BROWN & SHARPE No. 4 Universal
NORTON 6"x10"x36" Type G Surf. Grinder

ENGINE LATHES
SOUTH BEND 11"x4'
LeBLOND 16"x14'; 16"x6', geared head
LeBLOND 16"x10', 16"x14', rapid production
SOUTH BEND 16"x6' cone pulley
AMERICAN 16"x8', 18"x8', 20"x 8', cone
REED PRENTICE 20"x12' geared head
LODGE & SHIPLEY 20"x10' geared head
MONARCH 24"x10' geared head
LODGE & SHIPLEY 30"x26'; 2 carriages

TURRET LATHES
GISHOLT #2L Univ.; 12 speeds, Timken bearing
JONES & LAMSON 2¼"x24"
WARNER & SWASEY No. 3A Universal

HAND SCREW MACHINES
BROWN & SHARPE No. 2
BARDONS & OLIVER 2" capacity

AUTOMATIC SCREW MACHINES
CLEVELAND ⅜", 1¼", 2-2½" Model A

MILLING MACHINES
BROWN & SHARPE No. 3A Universal
MILWAUKEE No. 3B Universal
CINCINNATI No. 3 Vertical
BROWN & SHARPE No. 3 Vertical
P & W 6"x20" Model B, 6"x132" Thread
RICE BARTON 4" Duplex Spline
PRATT & WHITNEY 4" Spline
INGERSOLL 48"x48"x16' Adjustable Rail, 4 swivel heads
INGERSOLL 26"x26"x12' Adj. Rail Planer Type; 2 side heads, 2 heads on cross rail
SUNDSTRAND Rigid Mill; Table 60"x14½"

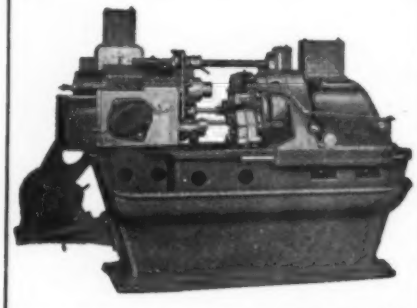
PLANERS
GRAY 30"x30"x8'—1 head
CINCINNATI 36"x36"x10'—4 heads
CINCINNATI 120"x96"x20' rapid traverse—4 heads; DC reversing motor drive
HAMILTON 42"x42"x20'—4 heads; DC M.D.
GRAY 48"x48"x16'—4 heads
GRAY 72"x48"x12'—2 heads
WOODWARD & POWELL 60"x60"x20'—4 heads

SHAPERS — Horiz. and Vert.
PRATT & WHITNEY 6" and 10" Vertical
MORTON 30" Draw Cut—Horizontal

MISCELLANEOUS
DILL 18" Slotter
ESPEN LUCAS No. 138 Cold Saw—12" cap.
SAUNDERS 8-18" Pipe Machine
TREADWELL 12" Pipe Machine
MORTON 60" Stroke Planing & Boring Machine
CLEVELAND Relieving Machine

PARTIAL LIST—SEND US YOUR SPECIFIC INQUIRY

MOREY MACHINERY CO., Inc.
410 BROOME STREET — NEW YORK, N. Y.



8½" X 8" GOSS & DELEEUW CHUCKING MACHINE

Capacity 8½" in diameter x 8" long 5 chucks on turret

Maximum opening between chuck jaws 9⅝"

Minimum opening between chuck jaws 7⅝"

Maximum distance spindle nose to face of turret 23¾"

Dies and taps controlled by positive lead screw

Arranged for Motor Drive, without motor
Weight approximately 12,000 lbs.

(Available for Prompt Delivery)

Emerman Machinery Corporation
875 W. 120th St., Chicago 43, Ill.

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14—Miller Electric Manufacturing Co. Model #103 18.6 KVA 300 Amps 14 KW 220/440 Single Phase 60 Cycle Ark Welders. Very latest type; new in 1943; excellent condition, used only slightly.

2—Smith Welding Equipment Co. 10 KVA 7.5 KW 220/440 S Single Phase 60 Cycle Ark Welders; condition equal to the above.

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For Full Particulars

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LARGE LATHES

30"x26' Lodge & Shipley 12 speed Geared Head, M.D.
32"x35' Wickes Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
36"x22' Putnam Geared D.C. M.D.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

8" x 18" Cincinnati Plain Grinder, M.D.
No. 2 LaPointe - Hudson Broach, M.D.

MDNA MEMBER

D. E. DONY MACHINERY CO.
47 Laurelton Road, Rochester 9, N.Y.

#425 Campbell Cutolator Wet Abrasive Cutting Machine
New Jan. 1945. With tube cutting attachment.
J. L. LUCAS & SON, INC.
P. O. BOX 607—NEW BRUNSWICK, N. J.

QUALITY TOOLS
Automatics, New Britain, Model 60, MD. (1943)
Bolt Threader, 2" Landis GB., MD. (1943)
Grinder, Univ. 10"x24" Landis, MD. (1943)
Turret Lathe, #2-G. Morey, MD. (1944)
Turret Lathe, #1 Warner & Swasey, MD. (1944)
GALBREATH MACHINERY CO.
Empire Building Pittsburgh, Pa.

Boring Mills, 36"-42"-52"-72"-96".
Belt Cutters 1"-1¼"-2"-2½" Acme-Landis
Lathes, 20" to 30" Geared Head, M.D.
Press, Forging 1000 Ton United, St.-Hyd.
Planer, 36"x36"x12' Powell 4 Hds.
Planer, O. S. 60"x60"x14' D. & H., M.D.
Profiler, #13 P. & W., B.D.
Shapers, 10"-20"-24"-36".
Shaper 36" Morton, Draw Cut
West Penn Machinery Company
1210 House Bldg. Pittsburgh, Pa.

Two #3 Cincinnati Centerless Grinders—New Feb. 1945. Motor driven.
J. L. LUCAS & SON, INC.
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IN STOCK

LATHES

48"x24' Blocked to 80" Fifield, D.B.G.
46"x20' b.c. Niles, 2 carriages, G.H. M.D.
36"x14' Niles, Q.C. G.H. M.D.
30"x17' Blocked to 58" Houston, Q.C. M.D.
16"x6' and 12"x6' Monarch, M.D.
Many others from 7" to 98" swing, Niles, Lodge & Shipley, American, Monarch, Hendey, Leblond, South Bend, Logan, etc.

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4½" Bardons & Oliver, bar feed, M.D.
3"x36" Jones & Lamson
#3, #4, #5, #2A #3A Warner & Swasey
1⅞" Milholland Bar Feed, M.D.
Many others from ⅝" to 6" Capacity

72"x72"x26' Sellers, 4 heads, M.D.

PLANERS

84"x74"x12' Gray, 3 heads, M.D.
72"x72"x26' Sellers, 4 Heads, M.D.
42"x48"x12' Cincinnati, 2 Heads, M.D.
30"x30"x8' and 10' Powell, 2 Heads, M.D. and many others from 24"

BORING MILLS

3½", 4", 5" Universal, Bausch
24" to 10' Bullard, Niles, Cincinnati, Betts, etc.

SHAPERS

10" to 36" Smith & Mills, Gould & Eberhardt, Stockbridge, Hendey, Pratt & Whitney, etc.

MILLERS

3'x3'x10' Ingersoll, planer type, 4 heads, M.D.
#2SU Van Norman Universal M.D.
#2, #3, #4, and #5 Universal M.D. Cincinnati, Brown & Sharpe, Milwaukee
#2H Milwaukee, Plain, M.D.
#4B Brown & Sharpe, Plain, M.D.
#4 Milwaukee, Plain, M.D.
#08 Cincinnati, Vertical, M.D.
#2 Brown & Sharpe, Vertical, M.D.
Pratt & Whitney and Lees Bradner Thread Millers
Brown & Sharpe and Cincinnati Production Millers, M.D.

AUTOMATICS

#00, #0, #2 Brown & Sharpe
2", 2½", 2¾" Cleveland, M.D.
Gridleys, Conomatics, New Britains, latest models

GRINDERS

Cylindrical Plain and Universal, Landis, Norton, Brown & Sharpe
#2 and #5 Brown & Sharpe Surface
#2 Cincinnati Centerless
Brown & Sharpe, Gallmeyer & Livingston, Cincinnati Universal Tool
#70 Heald Internal, M.D.
Pratt & Whitney and Springfield Vertical Surface

PUNCH, SHEARS

Bliss, Adlerhurst, Long & Allstetter, Excelsior, etc.

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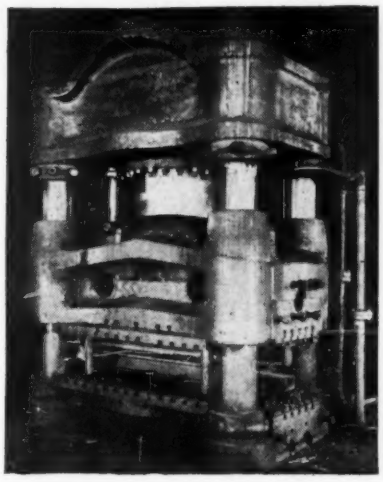
¼" to 7" Upsetters, Ajax, Waterbury
Hydraulic Presses, 250 to 3000 tons, Wood, Watson-Stillman, HPM, Farnham, Oil Gear Co., Etc.
Mechanical Power Presses, up to 2000 tons, Ferracute Toledo, Bliss, etc.



3000 Ton R.D. Wood Hydraulic

2000-Ton H-P-M Turret Type Heading Press
#60¼ Toledo Power Press, 1200-Ton
#58 Toledo Trimming Press, 150-Ton
#78½ Bliss Press
#5S Bliss Toggle Presses
#73½ Bliss Trimming Presses
#7 Bliss Press
#1½ Bliss Toggle Press
#4 United Engineering Press
#5C Ferracute Inclinable Press
#305½ Bliss Press, and many others
Steam Hammers from 100# to 35,000# Erie, Chambersburg, Niles, etc.
Bulldozers

MISCELLANEOUS

New #510 Campbell Abrasive Cutter, 10" x12'
Brakes, George A. Ohl, Loy & Nawrath, Dreis & Krump, Griswold
Bliss & Rafter Forming Rolls
Do-All Saws, Model V-26, M.D.
Many other special machines.

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LARGE STOCK ON HAND

Hasco MACHINERY COMPANY
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NEWARK 3, N. J. BIGELOW 3-2484-78

14" x 16" x 60" Mattison Surface Grinder

New Oct. 1942. Four motor drive.

J. L. LUCAS & SON, INC.
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600 TON HYDRAULIC PRESS

Watson Stillman rebuilt 48" single daylight opening downward double acting ram 16" dia. by 21" stroke, platen 24"x24" with clear space left to right 30¼" between 5½" dia. strain rods. We will purchase your Surplus Equipment.

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Rockford 24" Shaper, S.P.D. gear box.
Cleveland O.S. Planer 36"x8', 2 hds.
American 4' Radial Drill, encl. hd.
Cincinnati D.H. Planer 36"x36"x10', 2 hds.
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Bullard Vert. Turret Lathes, 24" & 36" S. Head
N.-B.-P. 84" Vert. Boring Mill, m.d. 2 hds.
Cleveland Horiz. Boring Mill, m.d. 2½" bar.
American 24" x 12' grd. hd. Lathe, m.d. q.c.g.
Amer. 4-ton vert. Hydr. Broach.
Blanchard Vert. Surf. Grinder, 26 rd. chuck.
Cincinnati #2 Centerless Grinder.
Diamond Horiz. Surf. Grinder, 12"x60" Table.
Pratt & Whitney 16"x6' M.D. Grd. Hd. Lathe
Cincinnati 1-M grd. hd., Univ. tool room Miller.
Cincinnati No. 5 H.P. grd. hd. S.P.D. Pl. Miller.
Milwaukee No. 3-B Vert. Miller grd. hd., m.d.
Cincinnati 48" Auto Pl. Prod. Miller, S.P.D.
W.&S. No. 2A & #1-A grd. hd.
Univ. Turret Lathe, S.P.D.
Foster No. 2F Fastermatic grd. hd. Turret Lathe, M.D.

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These machines can be seen in operation.
Must be moved fast to make room.

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4½" x 36" PRATT & WHITNEY MODEL C THREAD MILLER

New November 1944. Motor driven with internal and external hobbing attachments.

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MOREY
Dependable Used Machines

LATEST TYPE
Built 1941-1942-1943
TIMKEN BEARING
MOTOR DRIVEN

3 phase 60 cycle 220-440 volt

LUCAS No. 41, 3" bar, No. 42, 4" bar Hor. Boring Mill
BULLARD 36" spiral drive Ver. Turret Lathe with side heads
MONARCH 14"x30", 16"x54" between centers, 16-speed head Lathes
MONARCH 10"x20" EE Lathe
MONARCH 16"x30" between centers Lathe
LODGE & SHIPLEY 14"x30" centers, 14x78" centers, 16x30" centers Lathes
MOREY No. 2G Turret Lathe, 1" cap.
MOREY No. 3, 1½" cap., No. 4, 2" cap. Univ. Turret Lathes
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THOMPSON 6x18" Surface Grinder; type F
THOMPSON Type F Surface Grinder
B & S No. 3 Universal Grinder
MILWAUKEE No. 2H Plain Miller
B & S No. 2A Heavy Univ. Miller
B & S No. 2B Plain Miller
VAN NORMAN Nos. 26, 36 Univ. Millers
P & W 4½"x12" Th. Miller Model C
MOREY-SHIELDS 12"x60" Thread Mill
CINCINNATI No. 3 Ver. Miller
LINLEY high speed Ver. Miller & Jig Borer
GLEASON 12" Bevel Gear Cutter
MOREY 9x8", 12" Ver. Shapers
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Money Back If Not Satisfied

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CHIP SEPARATOR: Mackenzie, 2 motors, variable speed (1943) Price $150.
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G. & Eb. 24", vise, cts. (old) Price $375.
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LATE TYPE MACHINES

1—#5 B & S 3" x 18" Plain cylindrical grinder
2—#3H Milwaukee Plain milling machines
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1—#2K Milwaukee plain milling machine
1—#3 Warner-Swasey universal turret lathe (bar feed)
1—#3 Cincinnati plain milling machine (dial type)
1—#2H Milwaukee vertical milling machine
1—#3H Milwaukee vertical milling machine
2—6" x 18" Norton (hydraulic) Surface Grinders
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Machine Tools

42" Bullard Spiral Drive, Vertical Boring Mill, 1942
#18 Blanchard Surface Grinder, 30" Chuck, 1941
8" x 48" Jones & Lamson Automatic Thread Grinder, 1940
12" Gleason Straight Bevel Gear Generator, 1940
3'-11" Carlton Radial Drill
12" x 30" Monarch KK Lathe
14" x 30" Lodge & Shipley Lathe
#2-G Brown & Sharpe H.S. Automatic Screw Machine

Many more, large and small. Send us your inquiries.

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Dexter 8880

#49 HEALD DOUBLE HEAD BOREMATIC BORING MACHINE

New February 1943. Motor driven. Equipped with hydraulic cross slide arranged to feed to two directions.

J. L. LUCAS & SON, INC.
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40 KW HIGH FREQUENCY INDUCTION HEATING UNIT

New February 1945. With auto transformer, 3 phase, 60 cycle, 440 to 220 volts.

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DRILL RADIAL—FOSDICK 3½', G.B., M.D.
KEYSEATER—MITTS & MERRILL No. 6, M.D.
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PLANER, METAL—WOODWARD & POWELL 30"x30"x8', 1 rail head, 1 side head.
TURRET LATHES—FOSTER No. 1-B Univ., Inc. 2 Wrenchless Chucks, etc, M.D.; also W & S No. 2-A, Univ.

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Carbon and Alloy. Wide range of sizes from ¼" to 6" thick, up to 96" wide.

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7,000 tons. In Water-hardening, Oil-hardening and High Speed grades. Large range of bar sizes.

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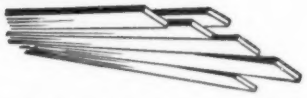

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Hot Rolled and Cold Finished in both Carbon and Alloy. Rounds, squares, flats and hexagons in various specifications. Many items in large quantities.

Write, wire or phone your requests to the nearest RFC agency listed below for more detailed information. If you desire, credit terms can be arranged. If your local office does not have all the materials you need, it will endeavor to locate them from other offices throughout the country.

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157-1

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AUTOMATICS, Acme 9/16" & 1" Mod. C 5 spdle.
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AUTOMATICS, Cone, 1¼, 2⅛ & 3⅛" 4 spdle
CONOMATIC, 1⅛—8 spindle, M.D.
AUTOMATICS, Gridley, ⅝, 1¼, 1¾ 2¼" & 2⅝" Model F, M.D.
AUTOMATICS, Gridley, 2¼, 3¼, & 5¼" S. S.
AUTOMATICS, Cleveland 1¼, 1½, 2, 2½, 3½ & 4¾" Model A, M.D.
AUTOMATICS, Cleveland ⅞, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland 3½" 4 spdle, Mod. K4
AUTOMATICS, Potter & Johnson #5a & 6a, M.D.
BORING MILLS, 30" Bullard, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6
GENERATOR, Gleason Spiral Bevel Gear 19"
GRINDERS Brown & Sharpe #2 & 3 Universal
GRINDER, Brown & Sharpe #11 Plain, M.D.
GRINDER, Heald #72 Hydraulic, 2 M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDER, Norton 10"x36" Hydraulic, M.D.
GRINDERS, Landis Hydraulic, 6"x18", M.D.
GRINDERS, Pratt & Whitney 12" Vertical Surface, M.D., 9x31", Magnetic Chuck
LATHES, Hendey 16"x6' & 8' & 18"x10'
LATHES, Rockford, 18"x8' Geared Head, M.D.
LATHES, Turret, Warner & Swasey #4 G.H.
LATHES Morey #3 G. H. Turret, M.D.
LATHES, Lo-Swing 4"x36" Seneca Falls
MILLING MACHINES, #2B Milw. & Vert. Hd.
MILLING MACHINES, Becker Vertical #5 & 6
MILLING MACHINES, Milwaukee #1B Plain & Universal #2 & 3B Plain, M.D.
MILLING MACHINES, #2B Rockford Universal
PLANER, Gray 30"x30"x8' 2 Rail Heads, M.D.
PLANER Ohio 42"x42"x12' One Head, M.D.
PLANER-SHAPER, 36" Cincinnati, M.D.

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Two—#401 Campbell Automatic Wet Abrasive Cutting Machine

New Dec. 1944. Capacity—solids up to 6". Three motor drive.

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P.O. BOX 607—NEW BRUNSWICK, N. J.

#3F-Fastermatic Turret Lathe, all Hydraulic, 4½" hole, 1 yr. old
#4 Univ. Mill, very good cond. $2,500.00
5" Bar Newark Horiz. Boring Mill, 8' Bed, M.D., $2250.00
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Quick Change Gear Lathes, $125.00 up complete
2½ and 3" Horiz. Boring Mill, 2 yrs. old
#3-B Pratt & Whitney Jig Borers, 1½ yrs. old
10x36 Norton Hydraulic Grinder, 1 yr. old

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For IMMEDIATE Delivery
SUITABLE for 1", 1½" and 2" CAPACITY TURRET LATHES
Ask for Catalog 943
MOREY MACHINERY CO., INC.
410 BROOME STREET, NEW YORK 13, N. Y.

#6 LANDIS
PRECISION THREAD GRINDER

New October 1944. Motor driven. Arranged for right hand threads.

J. L. LUCAS & SON, INC.
P.O. BOX 607—NEW BRUNSWICK, N. J.

CLOSEOUTS

BORING MILLS
HORIZONTAL
2½", 4" Binsee

VERTICAL
66", 120" Niles
54" Colburn, M.D., 2 hds.

TURRET LATHES
24" Bullard New Era
Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"
Acme 3¼" M.D.

GRINDERS
P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", MD.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
12" Heald Rotary, Arter 12" M.D.
B. & S. No. 2 Surface, M.D., Reid
Norton 10x36" Hydraulic, M.D.
B. & S. No. 10 1' Cyl.
No. 2 Cincinnati, Centerless, M.D.
B. & S. No. 1, 3 Universal

LATHES
McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, B.D.G.
20"x14' Rahn-Larmon, raised to 24"
14"x6', 16"x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x22' Putnam S.C.G., D.C.M.D.
32"x36' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
P. & W. 1x18, 1¼x18 Automatic Lathes

AUTOMATICS
B. & S. No. 2, 6F Hand Screw
B. & S. No. 00, 0, 00G
5 Spdle. Davenport 9/16" cap.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
P & J. 6A, M.D.
⅞" Cone 4 spindle

New In Stock
5, 10, 18 ton OBI Power Presses
7" Ammco Shapers
Halco H.S. Vertical Milling Heads, Drill Presses
Kalamazoo Metal Band Saw

RADIALS
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3', 4', 5' Cincinnatin-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

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Cincinnati, #2 Univ.
10" P. & W. Auto.
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Nos. 1Y, 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
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MISCELLANEOUS
Gorton No. 1S Engraving Machine
6 spindle Avey Drill, 15" overhang
McCabe ½" Flanger
Rochester No. 5½" B Hammer
Baker #2 Keyseater 5 P.D.
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
#7 Burr Keyseater
Natco No. 13 Multiple Spindle Drill
48" Southwark gate shear ½" 24" gap.

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62" Colburn heavy pattern
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42" Bullard vertical turret lathe
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No. 3 Kearney & Trecker vertical
No. 4 Cincinnati High Power vertical with Turchan follower
No. 2 Cincinnati plain
Nos. 2B & 3B Kearney & Trecker plain
No. 3 Sundstrand Rigidmil
No. 4-36 Cincinnati Hydromatic
No. 5 Plan-O-Mill planetary thread mill
No. 4 Lees Bradner Univ. thread mill

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36", No. 18 Blanchard rotary surface
18" Arter rotary surface
6"x18" Norton hydraulic surface
6"x18" Thompson hydraulic surface
12"x24" Diamond Surface
12"x36" Gallmeyer & Livingston hydr. surf.
No. 72A3 Heald Sizematic internal
No. 2 Cincinnati centerless
No. 2 Brown & Sharpe universal

HYDRAULIC BROACHES
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No. 2XB-12 Oilgear twin
Twin 10 Oilgear double
No. 4 Oilgear
No. 1 Foote Burt vertical surface

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Automatic, 14"x19" Fay
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Drill, Radial, 4' American Triple Purpose
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Gear Shapers, Nos. 7 & 61 Fellows
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Press, 150 ton Bliss coining
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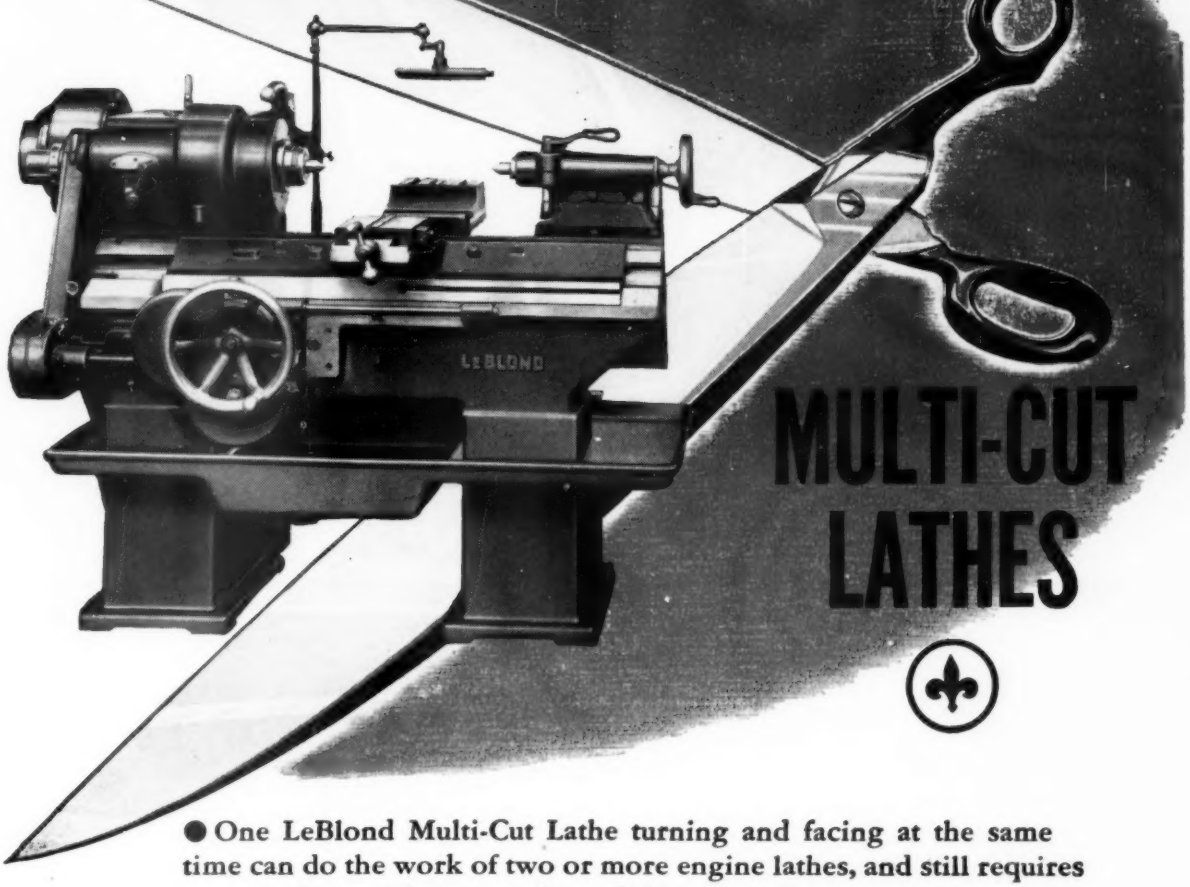

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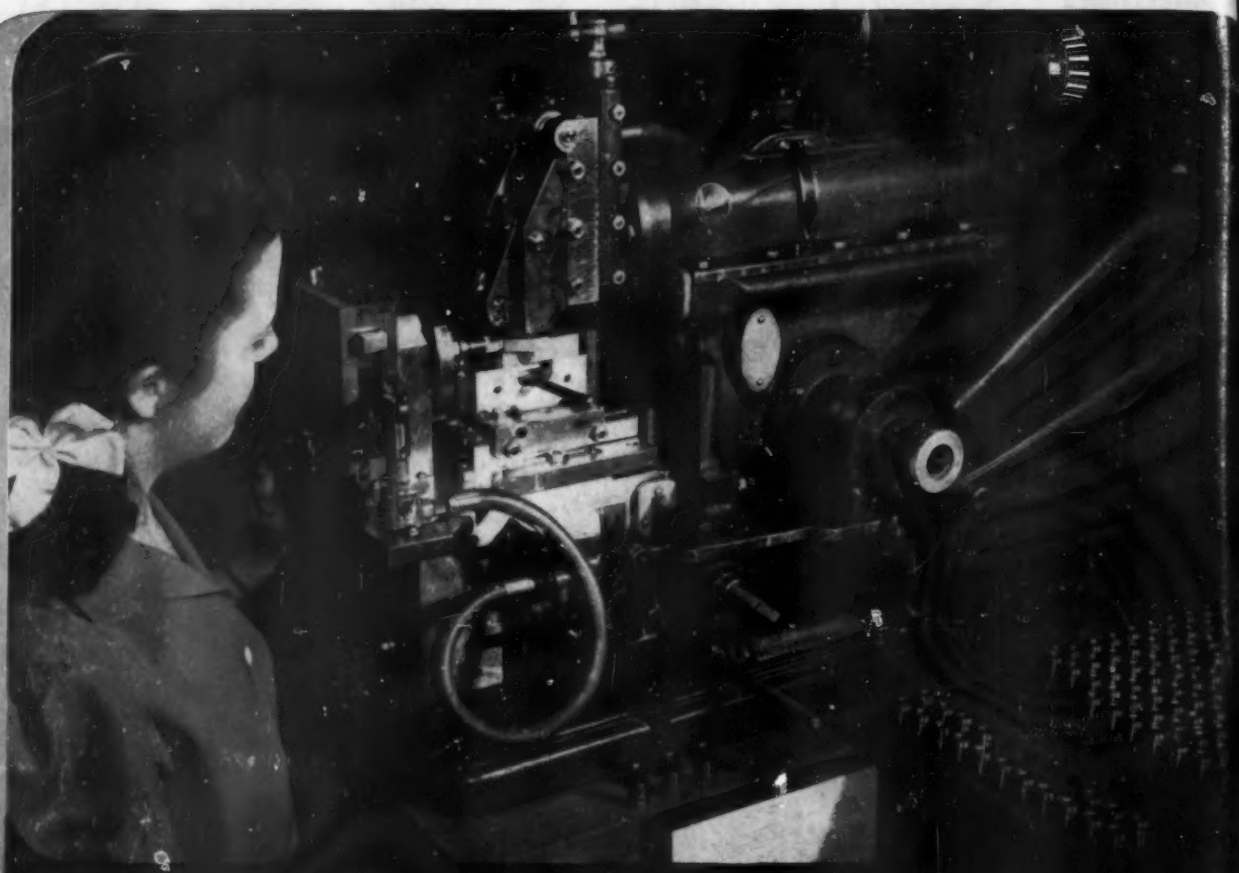

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